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# THE BUILDING AND CARE OF THE BODY

C. N. MILLARD

UC-NRLF

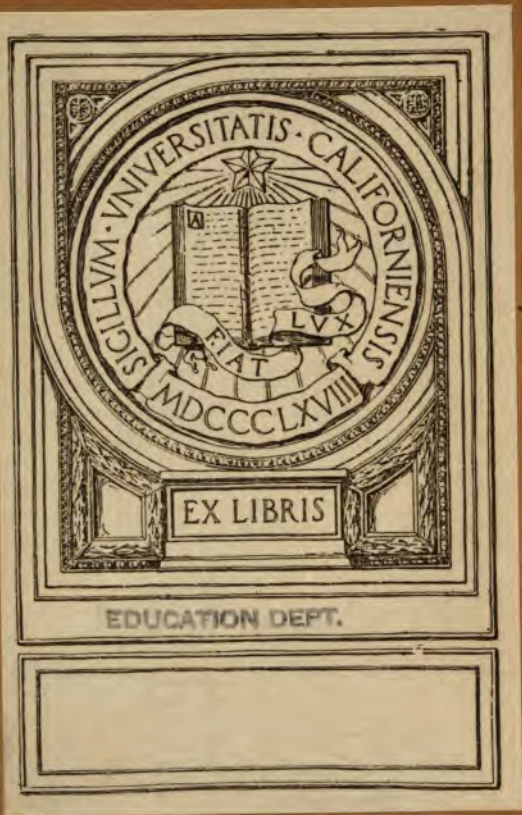


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THE BODY**



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# THE BUILDING AND CARE OF THE BODY

*AN ELEMENTARY TEXT-BOOK IN  
PRACTICAL PHYSIOLOGY  
AND HYGIENE*

BY

COLUMBUS N. MILLARD

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AUTHOR OF "THE WONDERFUL HOUSE THAT JACK HAS"

New York

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1910

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## PREFACE

TEACHING pupils to develop strong, healthy bodies should be one of the chief aims of our schools. That unwise habits of eating and breathing are often the cause of weakening the body and sowing the seed of future ill health is a well-known fact. That daily habits as to cleanliness, exercise, rest, and protection of the body are also very important factors in gaining and preserving health and strength is an equally familiar truth.

Habits in all these respects are formed early in life, and the longer incorrect ones are practiced, the more difficult it is to change them. Unfortunately, too, knowledge gained after the formation of incorrect bodily habits often effects few changes, unless chronic invalidism compels thereto. It naturally follows, then, that Physiology and Hygiene, the study in the school curriculum which especially has to do with the development and care of the body, should deal with topics that are vital to the formation of good health habits, and should present them in a way that will both interest and impress children. The statement that it is right or best to do or not to do certain

things often makes little or no lasting impression upon young folk. If they can be led to see, however, that certain practices are likely to make them better looking, abler in play and in work, and generally happier, more comfortable, and more useful, the information may be both retained and applied, for these benefits appeal to the child mind as well worth while.

As the title of this book, "The Building and Care of the Body," suggests, it has been written to fulfill the above stated conditions. Its aim throughout is to influence children to form habits likely to result in the development of strong, healthy bodies. The fact that bodily weakness is attended by discomfort and handicap, and that vigorous health results in improved appearance, more enjoyment, higher efficiency, and greater usefulness, is strongly emphasized. That each individual child is largely responsible for the health and efficiency which he will enjoy in manhood is also made prominent. In each chapter emphasis is placed upon the points vital to health. For example, under foods and digestion, the value of the various foods to the body, and the importance of the wise selection of foods, thorough mastication, and the daily evacuation of the waste products of digestion, are among the topics made especially prominent. Under respiration, the value of pure air, breathing through the nose, and rhythmic, deep breathing are

among the points especially emphasized, as are also the evil effects of adenoids and improper posture. The benefits of bathing, the importance of keeping the kidneys well flushed, the necessity for protecting the brain and spinal cord, the bad effects of obstructing the circulation, and the wisdom of guarding against contagious diseases, especially tuberculosis, is each made prominent in its respective chapter. An earnest endeavor has also been made to impress children with the great value of the eyes, ears, and teeth to the body, and to state the directions for protecting and preserving each so simply and clearly that they will appeal even to the youngest as both easy to follow and directly beneficial. The chapter on the care of little children should prove a valuable feature, since so many school children assist in the care of little ones at home.

Facts concerning anatomy and processes are given, if they can be readily understood, and will help children to see the need of forming habits conducive to health; otherwise they are omitted. After each chapter Points for Special Study are given, and these are printed so that they can be studied with the least possible strain to the eyes. Questions for use in study and recitation also follow each chapter.

Like the basic information in other studies, the essential facts of Physiology and Hygiene need con-

stant repetition, if they are to be well understood and practically applied. For this reason "The Building and Care of the Body" may be used to advantage in three successive grades. For example, in the fourth grade it may be read, and the important points talked over in class; the text may be profitably read and discussed again in the fifth grade, and the Points for Special Study memorized; and the whole may be carefully studied in the sixth grade, pupils being required to answer the questions following each chapter. Under the guidance of either teachers or parents, such use of the pages that follow should inspire children with the idea that health and strength are the best wealth, and that not medicine, but common sense in daily living, will insure them the possession of this splendid capital for the future.

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**THE BUILDING AND CARE OF  
THE BODY**





# THE BUILDING AND CARE OF THE BODY

## CHAPTER I

### THE BEST OF ALL GOOD THINGS

Why should so many years be spent in school? Most children would answer, "To learn." If asked the reason for learning, the reply would very likely be, "So that we can earn money when we grow older." Further question as to the benefits expected from the money would bring many different answers.

A beautiful home on the avenue might be the fond wish of some. Others might be hoping for positions of wealth and power; and still others, for travel in foreign countries, or some similar benefit in the future.

Many of these good things would, indeed, add much to one's power to be happy and useful, and so they are well worth striving for. But to enjoy any of them fully, there is something else that all need to have. That something is a strong, healthy body. With it one can be happy and useful, even though he is poor. Without good health one cannot be entirely happy,

no matter how rich he may be. For this reason a strong, healthy body may well be called one of the very best of all good things.

But how may this best of all good things be gained? Do not our bodies "just grow," like Topsy in "Uncle Tom's Cabin"? Do we not become healthy or sickly simply as a matter of luck? Surely children can do nothing to keep themselves strong. Mother, or nurse, or the doctor are the only ones who can do that.

Strange as it may seem, children do not become healthy or sickly just as a matter of luck. Mother, or nurse, or the doctor are not the only ones who can help keep boys and girls strong and well. In fact, the one who can do the most toward making any child a strong, healthy man or woman is that child himself.

"I should just like to know how!" some little folks may exclaim. "There are those big college girls or fellows who play ball, or golf, or tennis in such fine style! Or there is my Aunt Mary who can do everything so well, and is young and handsome at fifty! Or there is dear old grandfather, hale and hearty at seventy-five, who seems to enjoy life just as much as young people! I would surely work my hardest to become like them!"

It is possible to become like the grown-up young people who play games so well; or even like handsome,

useful Aunt Mary, or hale and hearty grandfather. Indeed, most children can gain such good fortune, if they only begin to try for it soon enough. Two things, however, must be learned if they succeed. The first is how to help wisely in the building of their bodies; the second, how to protect and to keep their bodies from harm.

The chapters which follow tell you how to do both of these important things. Read them as eagerly and earnestly as if they showed how to gain the largest of fortunes. Try also to put into daily practice what they teach. By so doing you will gain for yourself the best of all good things, a strong, healthy body.

## CHAPTER II

### THE BODY

Before we can learn to become good builders and caretakers of our bodies, we shall need to know the names of their chief parts. Of course we know such commonly named parts as the head, neck, arms, and legs. The part of the body between the neck and legs is called the *trunk*. The trunk is divided into two parts. The upper of these is named the *chest* or *thorax*, and it contains the *heart* and *lungs*.

The lower part of the trunk is named the *abdomen* (ăb-dō'měn). In the upper left-hand side of the abdomen is the *stomach*, and in the upper right-hand side, the *liver*. The intestines (în-tēs'tīnz) occupy the rest of the front side of the abdomen. Back of these are the *kidneys*, bladder, and other important organs.

The heart, lungs, stomach, liver, etc., are called *organs*, because they do important work in the body. Later on we shall learn the part each has, and how necessary all are to our health and well-being.

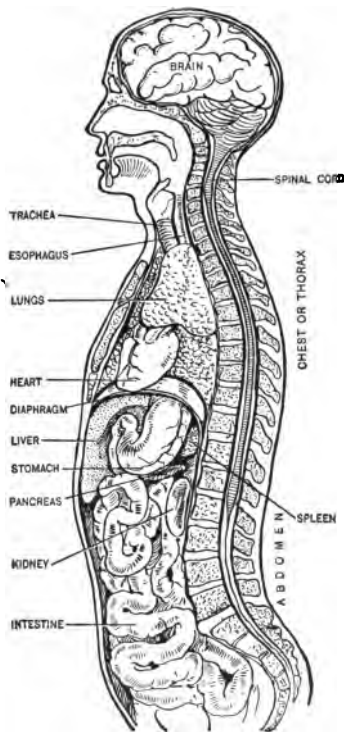
Did you ever see a butcher cut up an animal for the market? If so, you may have noticed that underneath the inside covering or skin there were both muscle

and fat. Under these you also saw the hard bone which he had to use an ax or saw to cut through.

**The Skeleton.** — In the human body there are about two hundred bones. All these bones in place together make up the *skeleton*. The skeleton is often spoken of as the framework of the body. On page 6 we see the skeleton of a man with the common names of its larger parts shown. These names should be learned, for they are often used.

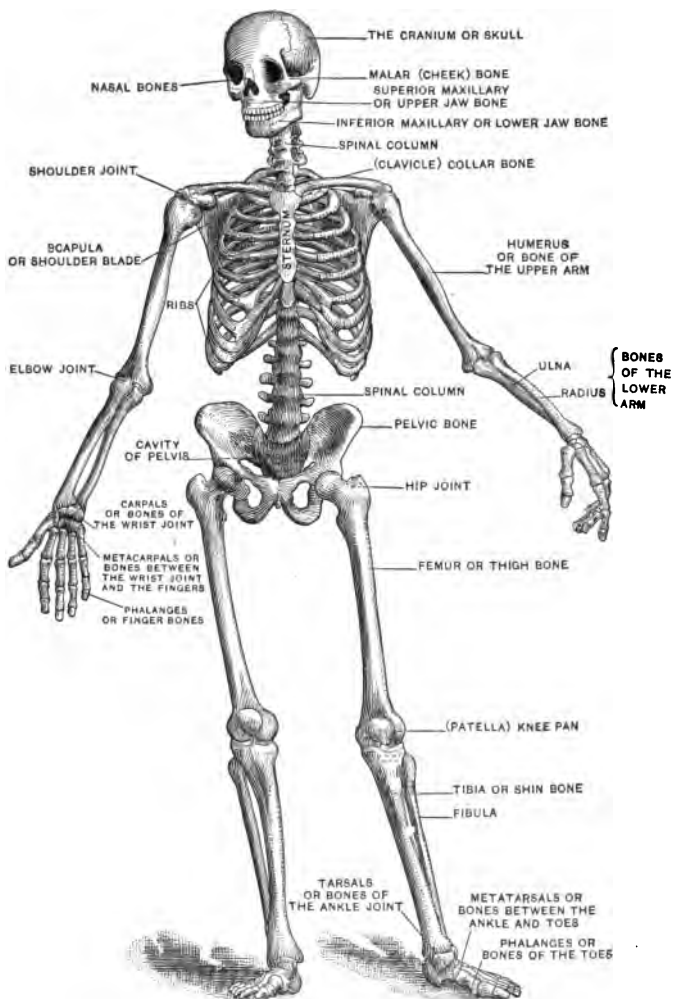
**Growth.** — All of us were once little babies. If we live to be twenty-one years old or more, we shall very likely be as tall as some of the men and women whom we know. In other words, we shall have our growth.

Year by year our bones, muscles, and organs will grow larger. Daily the tissues (tîsh'üz) (the thin layers that make up these bones, muscles, and organs) will



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Section of the body showing the positions of the organs in the cavities.



The Skeleton.

wear out and have to be repaired. Always the body must keep all of its parts warm. *Food, air, and water* are the materials the body makes use of for growth and repairs and for warmth.

**The Blood.** — Sometimes we have seen blood flow from a cut. Maybe we thought little of the blood or the cut, for it did not hurt much. But our parents or teachers quickly bound the wound to stop the flow of blood. They knew that blood is the great building agent which carries what is needed of food and air to all parts of the body. For this reason they feared we might be weakened by the loss of blood.

There are many good stories that we like to hear. I hope that there are also many of us that enjoy reading good books. But of all the good tales we have heard or read, few are more curious, and none can be of greater value to us, than the ones that are to follow.

These stories will tell how the body makes use of food, air, and water in building, warming, and repairing itself. At the very outset there is one fine thing that we shall be glad to hear. The better we know these stories, the handsomer, and happier, and more useful we can be. The better we can tell them to others, the more good we shall be able to do our friends.

**NOTE.** — After many of the chapters points for special study will be given. Pupils should be able to tell all of



these to their teachers and parents. They should also be able to answer the questions that are given.

### POINTS FOR SPECIAL STUDY

1. The part of the body between the neck and the legs is called the *trunk*.

2. The upper part of the trunk is named the *chest* or *thorax*. It contains the *lungs* and *heart*.

3. The lower part of the trunk is called the *abdomen*. It contains the *stomach*, *intestines*, *kidneys*, *liver*, and other important organs.

4. The body makes use of food, air, and water for growth and repairs and for warmth.

5. *Blood* is the great building agent that carries what is needed of the food and the air to every part of the body.

### QUESTIONS

1. Give the name of the part of the body between the neck and the legs.

2. What is the upper part of the trunk called, and what organs does it contain?

3. Name the lower part of the trunk, and tell what organs it contains.

4. About how many bones are there in the body?

5. What is the skeleton?

6. Name three materials that the body makes use of for growth, repairs, and for warmth.

7. In what are building and fuel materials carried to all parts of the body?

## CHAPTER III

### THE STORY OF FOOD IN BODY BUILDING

#### THE FOOD COMPONENTS

In the last chapter we learned that blood carries what is needed of the food to every part of the body. We know how unlike blood is to bread, vegetables, and many other foods. How great must be the changes before the food we eat is in such form that it can be taken into the blood!

**Food Components.** — A *component* (kõm-põ'něnt) of anything is one of the materials of which it is made. One of the first things to learn about food is that only certain of its components are of use to the body. These are p̄roteid (prō'tē-ĭd), fat, starch, and sugar, and some mineral salts, of which lime, iron, phosphorus (fõs'fõr-ŭs), and common salt are among the most important.

**Proteid** is the chief component of blood, muscle, and all the vital organs of the body. For this reason our food should contain plenty of proteid for the growth and repair of the tissues. Otherwise our muscles and organs will not be strong. The white of egg,

lean meat, peas, and beans are examples of food rich in proteid.

**Fat.** — We all know how useful coal is in furnishing warmth to homes and power to engines. Why is fat of similar use to the body? Because it furnishes fuel for warmth, and energy to give muscles the power of motion. Meat, cream, butter, olive oil, and lard are good examples of foods that are rich in fat.

When do our bodies need the most heat? In cold weather, of course; and that is the season during which, as a rule, we should eat the most fat. People of the polar regions eat large quantities (kwōn'tī-tīz) of tallow or whale blubber. Here such foods would be distasteful. There they need them for warmth, and so enjoy their taste.

When do our bodies need the most energy? Without doubt at times when the muscles are in active use. This explains why people who work hard or play hard need to eat much fat. When we are doing chiefly mental work, with little physical exercise, less fat should be eaten than when we are actively using the muscles.

**Starch.** — Starch also furnishes fuel to the body, but it does not give nearly so much heat and energy as fat. Potatoes have much starch. So also have flour, rice, oatmeal, and all cereals. In a temperate climate

the body should be supplied with much more starch than fat.

**Sugar.** — Sugar is another food component that furnishes heat and energy to the body. Perhaps we think of it chiefly as in sugar, candy, and sirup. It is also in milk, fruits, and certain vegetables, such as corn and beets. In fact, there are many factories in which sugar is made from beets.

Sugar is a good food when eaten in small quantities, but much should not be eaten at a time. The reason is that too much sugar is likely to get the digestive organs out of order. Without doubt many children are weak and sickly from eating too much candy and other foods rich in sugar.

**Salt.** — We may have read about animals traveling miles to find salt licks. They do this because they cannot live without salt. Men, too, must have salt, and that is why it is daily on our dining tables. It is better for food to be well seasoned with salt while being cooked. If it is, too much salt is not so likely to be eaten.

**Other Minerals.** — Lime is often in drinking water, and is present in most of the cereals. It is needed to keep the bones and other hard parts of the body strong and healthy. Small quantities of magnesia and soda are present in vegetables that grow under the ground. Iron is in all green vegetables. Phosphorus is in the

yolk of eggs. All of these minerals are needed by the body; and hence they must be supplied in the food we eat.

**Good Sense in the Use of Food.** — Of course we want to be just as good-looking and likable persons as we can. We want also, I am sure, to be just as skillful as possible at play and at work. Here is a fact, then, worthy of our careful attention (ăt-tĕn'shŭn). Using good sense daily as to what we eat will greatly aid us both in being and in doing our best.

If good lumber is used in its building, a house is usually strong and durable. So if food rich in building and fuel materials is supplied to our bodies, they, too, are likely to be strong and healthy. The saying, "Tell me what you eat, and I will tell you what you are," is really not a claim without good reason. We should, indeed, be thankful that, even while quite young, we can so easily learn the building value of the common foods.

#### POINTS FOR SPECIAL STUDY

1. The food components that are of use to the body are proteid, fat, starch, sugar, and certain minerals, of which salt, lime, and iron are among the most important.
2. Blood, muscle, and all the vital organs are chiefly made up of proteid. On this account much proteid must be supplied in our food to keep the body strong.
3. Fat furnishes the body fuel for warmth and energy for motion. More fat should be eaten in cold than in warm

weather; and more while at physical work than when at mental work. Growing children, as a rule, need much fat.

4. Sugar should be eaten only in small quantities. Many children are made weak and sickly by eating too much candy and other sweets.

### QUESTIONS

1. Name some foods that contain much proteid.
2. Mention some foods rich in fat.
3. What does starch furnish the body?
4. Name a few foods that have much starch.
5. Why do people in the polar regions eat much fat?
6. In what drink and food is lime found?
7. What minerals needed by the body are in the vegetables that grow underground?
8. What vegetables contain iron?
9. In what common food is phosphorus present?

## CHAPTER IV

### THE STORY OF FOOD IN BODY BUILDING

#### DIGESTION — THE FOOD PASSAGE AND ITS FLUID STATIONS

**Importance of Digestion.** — We have learned of what use the different food components are to the body. Is finding out which of these the common foods contain all that is now necessary for wise building? That might be true if the body could get the needed materials from all foods with equal ease.

But such is not the case. It is much harder for the useful components to be taken from some foods than it is from others. The changing of food in the body to a form from which building materials can readily be taken into the blood is called *digestion*.

Suppose we were sure that our future wealth would depend upon how well we knew arithmetic. Very likely we should need little urging to study that subject as well as we possibly could. Our greatest wealth in the future — health and happiness — will depend largely upon our digestion. Fortunately what we need to know about it can be learned much more easily than arithmetic, for there are no long tables to com-

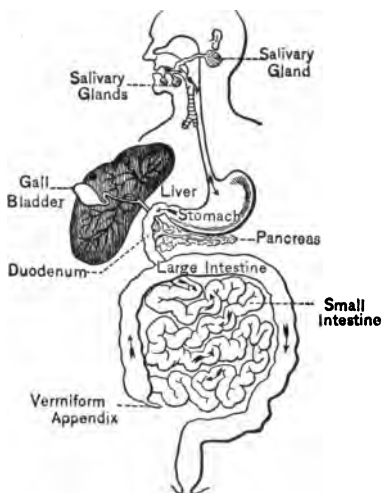
mit to memory. Indeed, the process of digestion is so curious that its study will be pleasure rather than work.

Most foods are solids. Blood is a liquid. For this reason food has to be dissolved or made liquid in form before being taken into the blood. In fact, digestion is largely a process of dissolving or changing the form of food. We shall now see where and by what this change in the form of food is brought about.

### The Food Canal. —

The passage in the body through which food passes is called the *alimentary* (ăl-ĭ-mĕn'-tă-rĭ) or *food canal*. Its parts in order are the *mouth*, *pharynx* (fă'rĭnks), *esophagus* (ĕ-sŏf'ă-gŭs), *stomach*, *small intestine*, and *large intestine*. The small and large intestines together are often called the *bowels*. The length of this passage in any person is, as a rule, five or six times his height.

That seems very long, since it is, at the most, only a few feet from the mouth to the base of the trunk.



Alimentary canal.



More than two-thirds of this length, however, is in the small intestine, which, as we can see in the picture on page 15, lies in the abdomen in coils.

**The Digestive Fluid Stations.** — In five places along this lengthy passage there are chemical (kěm'ŷ-kāl) stations supplying fluids that help digest food. These stations are called glands. How useful they are to the body, we shall soon see.

Who has not been interested in fairy stories about common things being changed into gold? Here is a fact more interesting and, at the same time, true. The fluids from the glands in the digestive passage change food into such form that its building and fuel materials may be taken into the blood. Let us now see where in the digestive passage these chemical or fluid stations are.

By looking at the picture on page 15 we can see that the first set is in the mouth, and that they are called *salivary glands*. The fluid they secrete is named *saliva*. The next set, the gastric glands, is in the lining of the stomach. They secrete *gastric juice*.

In the picture on page 15 notice the point where the stomach and small intestine join. Just at the right of this point is another chemical station in the food passage. It is called the *liver*, and the fluid it secretes is named *bile* or *gall*. By looking carefully at the picture on page 15 you will see a little sac called the *gall*

*bladder*, in which the bile or gall secreted by the liver is stored.

Just opposite the liver and on the left-hand side of the small intestine is the *pancreas* (păn'crê-ăs), which is also a chemical or fluid station of our food canal. The digestive fluid it secretes is called *pancreatic* (păn'-krê-ăt'ík) *juice*. This fluid enters the intestine through the same duct as the bile and at a point in the small intestine near the stomach. In the lining of the small intestine are the *intestinal glands*, the fifth and last of the fluid-secreting glands. They secrete *intestinal fluid*.

So we see that there are five fluids which mix with the food at different places along the digestive canal, and aid in digestion. After years of careful experiments, doctors have found out that each of these five fluids has its special work. The part each has in so changing food that its building and fuel materials can be taken into the blood, we shall read in chapters that follow.

#### POINTS FOR SPECIAL STUDY

1. It is harder for the digestive organs to take the useful components from some foods than from others.
2. The changing of food in the body to a form from which building materials can be readily taken into the blood is called *digestion*.
3. Solid food must be changed to liquid form before it can be taken into the blood.

4. The passage in the body through which food passes during digestion is called the *alimentary* or *food canal*. Its length is about five or six times a person's height.

5. The parts of the food canal in order are the mouth, the pharynx, the esophagus, the stomach, the small intestine, and the large intestine.

6. Along the food passage there are five different places where glands furnish fluids that assist in digestion.

### QUESTIONS

1. Which of the five parts of the food canal is the longest? What part of the length of the entire canal is it?

2. What glands are in the mouth, and what fluid do they secrete?

3. Where and by what glands is gastric juice secreted?

4. What fluid does the liver secrete, and where is this fluid stored?

5. By what is pancreatic juice secreted?

6. Where does the intestinal juice mix with the food?

7. What are the small and large intestines together often called?

## CHAPTER V

### THE STORY OF FOOD IN BODY BUILDING

#### MASTICATION

If bread or any similar food is left in water, it becomes soaked, and its parts separate. The warmer the water, the more quickly these changes take place. The smaller the parts into which the food is broken before being placed in the water, the more rapidly it will become moistened. If certain chemicals are added, greater and more rapid changes will take place.

**The Use of Saliva.** — Something similar happens when food is eaten. The action of the jaws in chewing, and the movement of food about the mouth, causes saliva to pour out from the glands, and mix with what is being chewed. The longer food is chewed, the finer it becomes, and the more freely saliva mixes with it.

Saliva is the fluid that keeps the inside of the mouth moist. Like water, saliva moistens food. It also contains an alkali (ăl'kă-lī) that digests or begins the digestion of starch. While saliva does not digest the other food components, it aids in changing them to a

liquid form, thus better preparing them for the juices farther on in the food passage.

**Benefits from Thoroughly Chewing Food.** — Another great benefit comes from thoroughly chewing food. Our appetite is satisfied when enough has been eaten. This is because food in a liquid or semi-liquid form affects the nerves of taste on the tongue. Poorly chewed food does not affect these nerves of taste, and so too much is likely to be eaten before the appetite is satisfied.

**Bad Results from not Chewing Food Thoroughly.** — Three bad results come from eating too fast and not chewing the food thoroughly. The digestion of starch is not well begun in the mouth. The other food components are not properly prepared for the digestive juices farther on. The sense of taste is not satisfied by partly chewed food, and so too much is likely to be eaten.

Have you ever heard a person say that his stomach felt as heavy as lead? Very likely he had been eating too fast. On that account his stomach was overloaded with food, which was neither well divided by the teeth nor well mixed with saliva. No wonder that it seemed heavy in his stomach.

**Effects of Cold or Acid Foods on Digestion.** — The following is another important fact that all can understand. The normal or usual temperature (tēm'pēr-

ā-tūr) of the inside of the mouth and stomach is about  $98\frac{1}{2}^{\circ}$ . Look at a thermometer, and notice how that point is marked. The digestive juices flow freely at that temperature, but when, from any cause, the inside of the mouth or stomach becomes cooler, both saliva and gastric juice cease mixing freely with the food.

For this reason much cold food or drink should not be taken with our meals. That is as plain as can be. Another point equally plain is that very little acid food, such as pickles, should be eaten, since acid weakens the effect of saliva. Much water also weakens or dilutes both saliva and gastric juice. Hence very little or no water should be drunk while eating.

**Loss from Hasty Eating.** — Children often eat hastily to get out quickly to play. Of course they do not stop to think that it takes good muscle to make skillful players. To build such muscle the best materials must be furnished the blood; these cannot be long supplied by poorly digested food.

Thoroughly chewing the food and mixing it with saliva is called *mastication* (mās-tī-kā'shūn). Complete mastication is one thing in preparing food for building materials in our bodies over which we have full control. It is easy enough to eat slowly and chew thoroughly, if one only gets into the habit of doing so. One does not have to be large or clever to learn to do either.

Only a little care and thought for a few days should fix the habit.

Sometimes people go to doctors, fearing that they have some serious disease of the digestive organs. Often the wise doctor advises three things: "Chew your food thoroughly. Drink little or no water with your meals. Do not take cold or



The wise doctor advises, "Chew your food thoroughly."

acid foods or drinks with your meals." Even very little people can follow such simple but wise advice. Surely any child can understand that the good looks and good feelings which the habit of thorough mastication is likely to bring, are a reward for which they may well work their very hardest.

#### POINTS FOR SPECIAL STUDY

1. Few things can count more toward making one healthy, strong, and happy than forming the habit of eating slowly and thoroughly chewing one's food at each meal.

2. Taking much cold food or drink with our meals lessens the flow of digestive juices, and thus retards digestion. If used at all, such food or drink should always be taken very slowly.

3. Water dilutes both saliva and gastric juice. For this reason it is not well to drink water at meals, nor within a half hour before or an hour or more after mealtime.

4. By chewing food thoroughly we keep from eating more than our bodies really need.

### QUESTIONS

1. Tell what happens to bread if it is left in water.

2. What fluid keeps the inside of the mouth moist?

3. What causes saliva to pour out from the glands in the mouth?

4. What component of food does saliva digest or begin the digestion of?

5. Mention *three* bad results of eating too fast.

6. Why does taking cold foods or drinks with meals retard digestion?

7. What effect has acid on the work of saliva?

8. Tell why children should not eat hastily to get out to play.

9. What *three* things about eating do doctors often advise their patients?



## CHAPTER VI

### THE STORY OF FOOD IN BODY BUILDING

#### DIGESTION IN THE STOMACH AND INTESTINES

**Stomach Digestion.** — Food passes from the mouth down through the pharynx and esophagus into the stomach. (See picture, page 15.) In the lining of the stomach are thousands of little glands from which gastric juice flows and mixes with the food. The mixing process is assisted by the muscles of the stomach which move the food along. In the half of the stomach near the small intestine, these muscles also keep up an active churning motion.

Gastric juice digests or begins the digestion of proteid. Food remains in the stomach from one to four or five hours. During this time it is changed into a soft pulpy substance called *chyme*. The muscle at the end of the stomach, the pylorus (pī-lō' rūś) or gate-keeper, then allows it to pass into the small intestine.

**Intestinal Digestion.** — In the small intestine bile, pancreatic juice, and intestinal fluid mix with the chyme. They act upon the fat and the undigested starch and proteids, and through their action the chyme

is changed to a liquid substance called *chyle*. On account of the great length of the small intestine, and the fact that its lining lies in crescent-like ridges, the food is, as a rule, from four to fifteen hours in passing through it. Thus the digestive juices are given a long time to do their work.



Small intestine cut open to show the folds of the mucous membrane.

**Absorption** (ăb-sôrp'shŭn). — But how does the blood get its building and fuel materials from chyle? Growing from the inner lining of the small intestine are tiny hairlike projections (prô-jĕk'shŭnz) called *villi* (vĭl'i). Near the stomach there are but few of these, but the number increases until, farther on, the lining of the small intestine looks quite like velvet, because there are so many.

Even though they are so tiny, these villi contain blood vessels, which soak up the digested part of the food. It is thus taken into the blood and carried to whatever part of the body needs such materials.

**Waste Products of Digestion.** — What becomes of the waste and the undigested parts of the food? The muscles of the abdomen and the intestine force these through the large intestine and out of the body. It is most important that the body should rid itself of these waste materials each day. Often they are very poisonous. If they remain too long in the intestine, this

poison is taken into the blood, causing headache, vomiting, and other serious sickness.

Such unpleasant results may be prevented by a thorough movement of the bowels daily. For several good reasons, early in the morning is the best time. Attending to this important duty at a regular hour each day will soon form the correct habit. Like thorough mastication, it is one of the few habits that may add much to our comfort and usefulness. Its neglect will in time bring discomfort and ill health.

#### POINTS FOR SPECIAL STUDY

1. If food is not thoroughly chewed, gastric juice does not act upon it readily.
2. We should not drink much water at meals, because it dilutes the gastric juice.
3. Very little cold food or drink should be taken with our meals. It may lower the temperature of the stomach and lessen the flow of gastric juice.
4. We should form the habit of having a thorough movement of the bowels daily. This habit will greatly assist us in keeping well and strong.

#### QUESTIONS

1. What component of food does gastric juice digest or begin the digestion of?
2. About how long does food remain in the stomach?
3. What three digestive fluids act upon chyme in the small intestine?
4. Why does it take food several hours to pass through the small intestine? Where are the villi? Tell their use.

## CHAPTER VII

### THE STORY OF FOOD IN BODY BUILDING

#### SOME FACTS TO REMEMBER ABOUT EATING

The more a builder knows about his materials and how to use them, the better the house he can construct. The more we know about foods and digestion, the healthier and stronger we can be. Of course we must put the knowledge into daily practice, or it will do us little good.

The glands in our food canal secrete or take their juices from the blood. When any part of the body is being actively used, an extra supply of blood goes to that part. At mealtime the stomach, of course, needs an extra supply of blood from which its glands may take gastric juice.

**Hard Work or Play near Mealtime.** — If we play or work hard just before meals, our arms, legs, brains, or some other parts of the body are using more blood than usual. This being the case, it takes the stomach longer to get the large supply of blood needed by its muscles and glands to digest the food properly. Hence if this practice is often followed, digestion is likely to be weakened.

We should remember not to study, work, or play hard just before or soon after meals. If we can avoid doing so, it is also well not to go to meals with either mind or body very tired. A few minutes' rest will often get all the organs in better condition for work. A little care in this respect will enable us both to work and to



Table set for four persons.

play better at the right time. But some children may say, "We won't stop playing hard on account of digestion, — we are having so much fun"; or, "We simply must do this study now or lose credit!" Wise business men invest for the future. Is it not wise, too, for children to think of future enjoyment both as to play and to study?

**Effect of Excitement on Digestion.** — Sorrow or excitement at meals lessens the flow of the digestive juices. It is the lack of saliva that makes one's mouth so dry when speaking the first piece in public. A man who is nervous about speaking at a public dinner does not

eat very much. One reason for this is that the gastric juice is not flowing freely.

Perhaps you have seen a person lose his appetite at a meal on account of receiving an unexpected telegram. Laughing and being happy stimulate the digestive glands to better action. For this reason it is well to be free from thought and care at meal-time and thoroughly enjoy ourselves. Lessons, work, anything that causes hard thought or may excite worry, should be put aside from the mind.

**Cooking and serving Food.** — Sometimes when we are hungry, the very smell of food causes saliva to pour out into our mouths. If we speak of it at all, we say, "That food makes my mouth water."

Savory food makes the glands of both the mouth and stomach pour out their juice more freely than unsavory food. Food that looks appetizing (ăp'pě-tiz-ing)



An invalid's tray.

has a similar effect; and so does that which tastes well. All of these facts show why our meals should be well cooked and attractively served.

For a similar reason it is well to commence a meal with some food that has a pleasing taste. Soup is especially good for this purpose. Being a liquid, it affects the taste nerves of the tongue more quickly than solid food. The pleasant taste and the odor both stimulate the glands of the mouth and stomach. Its temperature, if not too hot, has a similar effect.

**Resting the Digestive Organs.** — How angry it often makes us to see a man whip a horse that seems to be doing its very best! Some people use just as little sense with their digestive organs. How? They overload their stomachs with half-chewed food, and then take medicine to force the digestive organs to make up for their lack of care and wisdom.

Usually (ū'zhū-āl-lŷ) the medicine does spur the glands to harder work, and the bowels are made to move. The glands have to rest, however, to make up for the overwork, and so they may not be able readily to digest the next meal that arrives. We all know how much benefit is often gained from a few hours' sleep, when we are tired. Rest is often the best remedy for overworked digestive organs. If one feels that he has eaten too much, it is sensible to eat very little or not at all for a meal or two.

**Between Meals.** — Many children do not seem to know that the digestive organs must have some regular rest. Their parents, too, appear to be ignorant of the same thing. Such children eat candy, cake, and other food at recess, during school hours, or any time they happen to want to eat, when at home.

The parents wonder why these children have so little appetite at the regular meals. They cannot understand why neither the beauty nor the health of which the baby years gave promise is present. They are also puzzled to know what makes their children so cross and ill-tempered.

Eating between meals might easily be the cause of all these things. Their children's digestive organs have not had the rest that they needed, and so have worked badly. As a natural result, their food has not been well digested, and, of course, neither their health nor their feelings can be the best. Such children very likely think themselves most fortunate to get these "goodies" when they want them. As a matter of fact, it is one of the most unfortunate things possible for them.

**Soaking Foods.** — Another very bad habit is that of soaking cookies, cake, or any other food in some liquid we are taking with our meals. Such food usually contains much starch which should be thoroughly mixed with saliva before passing into the stomach.



Of course, after being soaked it is readily swallowed without mastication.

**Tobacco and Digestion.** — Some men and a few boys use tobacco. It is not a clean habit. Besides injuring in other ways, it wastes saliva, because of the large amount of expectoration (ěks-pěk'tō-rā'shŭn). On account of the waste of saliva, chewing gum is also a habit that one should avoid.

**Alcohol and Digestion.** — There are people who use alcoholic drinks with meals, thinking that they assist digestion. This is a great mistake. It has been proved that such drinks inflame the stomach and retard digestion. Alcohol is not a food, and should be taken only when prescribed by a physician.

#### POINTS FOR SPECIAL STUDY

1. Rest from hard play or study for a few minutes before and for a half hour or more after meals will make us able to work and to play better at other times. It will also help us to keep in condition for enjoying both work and play, no matter how old we may become. .

2. Happiness at mealtime stimulates the digestive glands to better work. Sadness or excitement has the opposite effect.

3. Food that looks well and has a pleasing taste causes the digestive glands to work better than food that is not pleasing.

4. Rest is often the best cure for digestive organs that have been overworked. One should take little or no medicine, unless advised to do so by a physician.

5. Eating between meals causes much ill health. It is a poor practice for children who really enjoy fun, and care to look their best.

### QUESTIONS

1. From what do the digestive glands take their juices?
2. Why does hard study or play just before or soon after meals retard digestion?
3. What effect has sorrow or excitement upon digestion, and why?
4. How does the smell of savory food affect the digestive glands?
5. Why is soup a good food with which to begin a hearty meal?
6. Tell how the way some people treat their stomachs is like the bad treatment of an overloaded horse.
7. Why is rest one of the best remedies for overeating?
8. Mention some bad effects of eating between meals.
9. Tell why soaking food that we are about to eat is an unwise habit.
10. Tell why using tobacco is not good for digestion.
11. Why should gum chewing be avoided?
12. Give two good reasons why alcoholic drinks are not good for digestion.

## CHAPTER VIII

### THE STORY OF FOOD IN BODY BUILDING

#### MILK AND ITS PRODUCTS

We have now learned about the useful components of food, and how the digestive juices prepare them for the blood. From these facts we know that the value of what we eat, to the body, may be judged by two things. First, which and how much of the useful food components does the food contain? Second, with what ease can the digestive juices separate these from the waste and make use of them?

For some years we may have been eating many common foods largely because we liked them, and with little or no knowledge as to the benefit our bodies might receive from them. Surely it will now be interesting to learn about their building and fuel value, and ease of digestion. Who can tell how much benefit this information may be to some of us, if we are sensible enough to make use of it at our daily meals?

**Components of Milk.** — Milk is about seven-eighths water. The other eighth is made up of nearly equal parts of sugar, fat, and proteid, and a much smaller amount of mineral salts. Since so much of milk is

water, one might think its food value slight. Nevertheless, since it contains all the building and fuel components the body needs, and is, as a rule, easily digested, it is one of the most valuable of foods.

**Cream.** — Few children need to be told what cream is, for they have seen it taken from the top of the bottle or can of milk. Cream rises to the top of milk that is left standing because it is lighter in weight than the rest. From one-fifth to two-fifths of cream is fat. Cream sells for about four times as much as milk. For this reason, dishonest dealers skim some of the cream off before delivering milk to customers. Such dealers may also put skimmed milk or water into their milk to increase the quantity. In both cases the value of the milk as food is decreased.

It is fortunate that such fraud can be readily detected. When pure milk is poured from a glass, it will not run off, as will water or tea, but some of it will cling to the sides. If the cream that rises on milk is not from *one-tenth* to *one-fifth* of the whole, then we may know the milk is not as pure as it should be. When milk looks thin or has a bluish color, we may be quite sure that it is skimmed or watered.

**Keeping Milk Sweet.** — To be valuable as food, milk must also be sweet. The air contains millions of vegetable organisms (ör'găn-izmz), called *bacteria* (băk-tě'ri-ă), which are too small to be seen without a

microscope (mī'krō-skōp). Later we shall learn that some of these produce disease. Others bring about the molding or decay of food, and still others cause milk to sour.

**Bacteria and Milk.** — Under favorable conditions bacteria increase so rapidly that one may multiply to a colony of several millions in twenty-four hours. This is the reason they can do so much damage. They can do little harm, however, in a temperature of from thirty-two to fifty degrees. (See picture of thermometer, page 80.) A temperature of from one hundred fifty-five to two hundred two degrees destroys them, if it is kept at that point for from fifteen to twenty minutes.

**Pasteurized and Sterilized Milk.** — Milk that has been kept for ten or fifteen minutes at a temperature of one hundred fifty-five degrees is called "pasteurized" milk, and the name "sterilized" milk is given when it has been kept at a temperature of two hundred two degrees fifteen minutes. Either can usually be bought in cities. Neither digests as readily as milk that has not been heated. In hot weather, however, or at any time there is reason to think that the milk has not been carefully handled, it is well to pasteurize or sterilize it. It will then keep better, and there is less chance of injury to the little children that drink it.

**Care of Milk.** — Bacteria get into milk from the milker's hands, from the cow, from the air of the barn,

or from unclean bottles or dishes. The cleaner all of these are kept, the smaller the number of bacteria that will get into the milk. Scarlet fever and similar diseases are often spread by means of milk. No one who is recovering from such diseases or is in any way exposed



Milking time.

to them should milk cows or do any work about a dairy. After milking, the dairyman strains the milk. This should be done in a clean, cool milk house away from the dust of the barn. When milk is carelessly handled, ten thousand or more bacteria are often found in one drop. But when the dairy is clean and the milk is handled with great care, it may have as few as from

one hundred to two hundred bacteria in a drop. The latter milk will keep sweet much longer than the former.

Milk should be placed on ice soon after milking. Then the bacteria it contains will not increase so fast as they would in warm air. All cans, bottles, and other utensils used in handling milk should be thoroughly cleansed in boiling hot water to kill the bacteria that may have remained on the inside. There should not be any deposit of dirt in the bottom of a dish in which milk has been standing. Such a deposit is a sign of careless handling at the dairy.

Glass can be cleaned much more readily than tin. For this reason it is better to buy milk that is delivered in glass bottles. As soon as milk is delivered, it should be placed in the ice box or in the coolest place in the house. A dish containing milk should not be left uncovered, except when in actual use on the table.

**Souring Milk.** — It is natural for milk to sour when left some time in a warm place. To keep milk from souring, dishonest dealers sometimes, in warm weather, put certain drugs in it. The use of drugs for this purpose is forbidden by law, since milk containing them may be injurious. If milk does not sour after being left for some hours in a warm place, it is a sign that drugs have been used in it. We should be very careful not to buy such milk, especially when there are little children in the family.

No matter who is using the milk, it is well to be very particular about its care. If there is a baby in the house, extra pains should be taken. Thousands of these helpless infants die each year because of impure and carelessly handled milk.

**Our Milk Dealer.** — It is important to know three things about the one from whom we buy milk. First, that he is clean. Second, that his cow stables are kept neat and clean, and likewise his helpers. Third, that he has a tidy milk house, with plenty of ice to keep the milk cool, and a large supply of hot water with which to clean utensils that have been used in handling the milk. A visit costing but a few cents carfare will often give us this information. This is indeed but a small thing, yet it might easily save the life or health of a precious child.

**Skimmed Milk.** — The part of milk that is left after the cream has been taken off is called *skimmed milk*. Although only a very little fat is left in skimmed milk, it still has the other components, and so is a useful food. Its cost is usually less than half that of pure milk. Families who cannot afford much of the latter will find skimmed milk an inexpensive and useful food.

**Condensed Milk.** — Condensed milk is made as follows. First the water is evaporated. Then the remaining components are heated to a high temperature to kill all bacteria. Some sugar is added, and it is



sealed up in cans. In these it is sent long distances and does not spoil. Much use is made of condensed milk in regions where but few cows are kept.

**Butter and Buttermilk.** — Butter is made by churning cream, and so is composed mostly of fat and water. It is an excellent food, and one all should try to like. Buttermilk is what is left of the churned cream after the butter has been removed. It is a refreshing and healthful drink.

**Cheese.** — Cheese is made from sour milk. The kinds and the cost depend upon the amount of cream that is left in the milk, — the more cream, the greater the cost. Cheese is rich in food elements, but is difficult for many to digest. On this account only a small piece should, as a rule, be eaten at a meal; some prefer not to eat cheese at all.

#### POINTS FOR SPECIAL STUDY

1. Pure milk contains all the necessary building and fuel components, and so is a most valuable food. In some diseases it is the best food for the sick person to use for days, and even weeks at a time. It is important to cultivate a liking for milk, or at least not to dislike it.

2. It is much better to buy milk that is delivered in bottles than that which is carried from house to house in cans.

3. As soon as milk is delivered, it should be put in the coolest place in the house, and kept there except when in use. A cool temperature keeps bacteria from multiplying rapidly in milk.

4. No one who is exposed to scarlet fever and similar diseases should in any way help in preparing milk for sale.

### QUESTIONS

1. About what part of milk is water?
2. Why is milk a most valuable food?
3. About what part of the milk should cream be?
4. Mention three ways in which you can tell whether milk is pure.
5. What causes milk to sour?
6. Mention two ways in which bacteria may be kept from multiplying in milk.
7. State some ways in which great pains should be taken in handling milk.
8. Tell the use of ice in a dairy; of hot water.
9. How do dishonest dealers prevent the souring of milk in warm weather?
10. Why should homes in which there is a baby be especially careful as to the purity and source of the milk?
11. Tell what is said of skimmed milk.
12. How is condensed milk prepared?
13. Of what is butter mostly composed?
14. What is said of buttermilk?
15. From what is cheese made?
16. Why should only a little cheese usually be eaten at a meal?

## CHAPTER IX

### THE STORY OF FOOD IN BODY BUILDING

#### EGGS, MEAT, AND FISH

**Egg Components.** — The white of an egg is largely proteid, and the yolk is well stored with fat. Besides being about seven-tenths water, the inside of an egg also has some valuable mineral salts.



Graphic composition of an egg.  
Ash represents the mineral salts.

**Digestion of Eggs.** — Eggs are easily digested, and, like milk, are among the most useful of foods. Soft-cooked eggs are more readily digested than are hard-cooked. Coddled, soft-poached, and soft-boiled are among the most digestible forms in

which eggs are prepared, and fried eggs are among the least readily digested. When an egg is placed in boiling water and left a few minutes off the stove, it is called a *coddled* egg. This is the best way to prepare them for little children or invalids.

**Keeping Eggs Fresh.** — The shell of an egg is porous, and so water from its inside is evaporated through the shell. Bacteria can also pass through the shell to the inside of the egg. Cool air takes up water less readily than warm air. The cooler air is, the less rapidly bacteria can multiply in it. For both of these reasons eggs should be kept in the coolest place in the house, if they are to remain fit for use.

Because eggs are such nutritious (nū-trīsh' ūs) food and so easily digested, they are often fed to the sick. Now the fresher the eggs, the pleasanter they are to the taste, and the better food they make. When an egg is broken, if it is fresh, the yolk will hold together well; but if it is stale, the yolk will spread apart.

**Components and Digestion of Meats.** — Meat contains fat, proteid, water, and mineral salts. Chicken and mutton are among the most easily digested meats. Beef and lamb are both much used and not hard to digest. Veal and pork are among the most difficult meats to digest. Dried beef is not as easy to digest as fresh beef. Salted and smoked pork (ham and bacon) is more easily digested than fresh pork. Indeed, boiled ham and crisply fried bacon are often fed to invalids.

**How to tell Bad Meat.** — Veal that has been killed too young is called "bob" veal. It can be told by its flabby flesh and bluish color. It is not fit for food. Any meat should feel dry and firm after being kept in

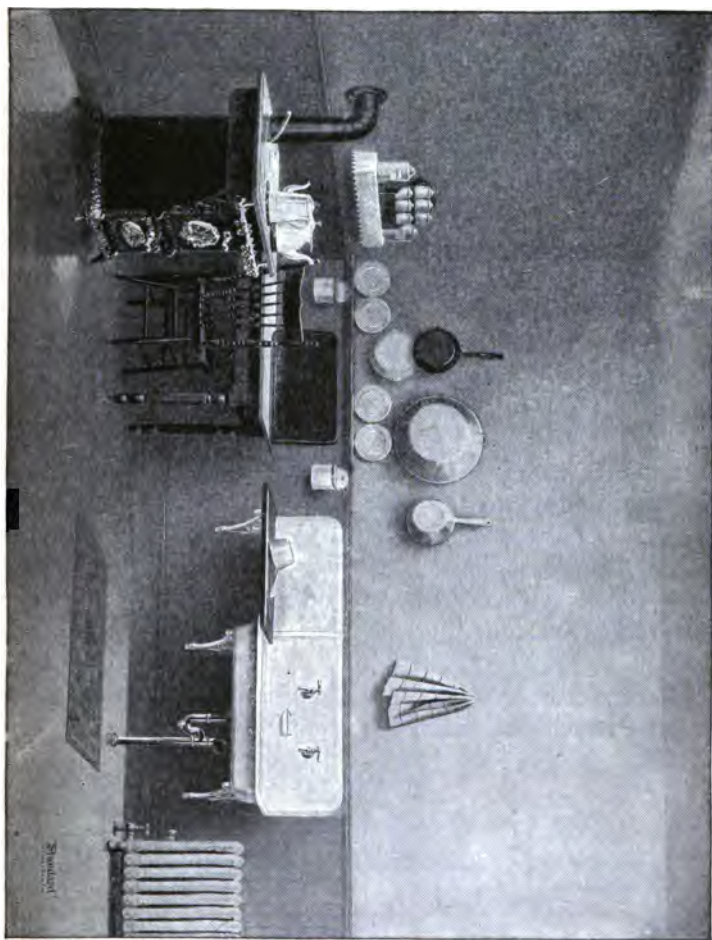
a cool place; if it is wet and flabby, it is probably not good. Bad pork is dotted with grayish white spots. Sausage is not a safe food, because dishonest dealers make it from bad pork.

**Preparing Meats and Soups.** — Heat hardens the surface of meat and thus keeps the juices from running out. For this reason, in cooking, meat should be placed in a very hot oven or over a hot flame. The heat may be afterward reduced, so that only the outer surface becomes hardened. Meat prepared in this way tastes better and digests more easily than when the juices are allowed to escape and the fibers to harden all through.

In making soups from meat, it is well to draw out all the juice possible. Therefore soup meat is placed in cold water and left standing for hours over a slow fire. Meat is thought to be the most readily digested when it is rare broiled or roasted. Pork, however, should always be well done, since it often contains injurious worms, called *trichinæ*, which are too small to be seen.

**Fish.** — Like meat, fish is well supplied with proteid, fat, water, and mineral salts. Fish are not good if the odor is bad, or if the flesh feels soft, flabby, or spongy, or is of either a yellowish or a bluish color. Should the water in which fish is washed or boiled blacken silver, it is likely to be poisonous.

Fish is best when boiled or baked, and in cooking it should be at once put into a very hot place. Fish



Sanitary kitchen.

is likely to be more wholesome in summer than in winter, since after thawing, poisons sometimes develop in it. Salmon and other fish are put up in tin cans. After these are opened, they should not be left in the can or long exposed to the air. When they are left in this way, they sometimes become unwholesome.

### POINTS FOR SPECIAL STUDY

1. Eggs are one of the most valuable of foods. It is well to form a liking for eggs, because they are often very beneficial in severe sickness.

2. Eggs are an excellent food for breakfast or lunch. Even in winter, when they often cost forty-five or fifty cents a dozen, it is better to eat eggs at these meals than meat.

3. Some people think they must eat meat to be strong. This is not true, because there are many strong people who do not eat meat at all. Other foods have the same building and fuel components.

4. There are many who eat too much meat. Unless one is working at hard physical labor, it is better not to eat meat more than once a day.

5. Either meat or fish that has a bad taste or odor before or after cooking should not be eaten.

### QUESTIONS

1. Tell what useful food components an egg contains.
2. What are coddled eggs? What is said of fried eggs?
3. Why should eggs be kept in the coolest place in the house?
4. How can one tell whether an egg is stale?
5. Tell all you can that is said about eggs.

6. Name two meats that are among the most easy to digest; two that are among the most difficult.
7. How may bad meat be told?
8. Why is sausage not a safe food?
9. Tell what is said about cooking meats; about preparing soups.
10. Why should pork always be cooked well done?
11. What meats are most readily digested?
12. What is said of fried meats?
13. Tell all you can remember that is said about meats and their preparation for food.
14. Why is fish valuable food?
15. When is fish unfit for use?
16. Tell what is said about canned fish.



## CHAPTER X

### THE STORY OF FOOD IN BODY BUILDING

#### GRAINS AND GRAIN FOODS

**Wheat.** — Of the grains wheat is the most used as food in this country. About three-fifths of wheat is starch, one-eighth proteid, and one-seventh water. Wheat also has very small parts of sugar and fat, and is well supplied with mineral salts.

**Corn and Oatmeal.** — Corn has less proteid than wheat, and more than twice as much fat; but it is less readily digested. Oatmeal contains about three times as much fat, twice as much mineral salts, and only a little less proteid than wheat. Oatmeal should be cooked a long time. When thoroughly cooked, it is an excellent food, especially in winter.

**Rice.** — Rice has quite a little more starch than wheat and nearly as much fat, but only about half the amount of proteid. It is often fed to invalids because it is readily digested. In several countries of Asia rice is the principal food. Since rice has but little fat and proteid, it should be eaten with foods that supply these necessary elements.

**Keeping Flour and Bread.** — Flour and meal should be kept in a dry place, since bacteria, called mold, develop in that which is moist. After bread has been baked, it should be aired, and then placed in a tin box



**First rising of bread dough; taking the temperature of the water.**



**Kneading bread.**

or earthen jar. Such dishes help to keep bread moist, and to prevent mold from spoiling it.

**Digestion of Flour Foods.** — The following are some good facts to remember about our daily bread. That which is a day or more old is more readily digestible than newly baked bread. Well-done bread is more easily digested than that which is soggy. Toast is the form of bread that is the most readily digested.

For this reason it is often fed to invalids. Crackers are a wholesome form of flour food. One good thing about both toast and crackers is that neither can be readily swallowed until fairly well chewed.

Biscuits, muffins, dumplings, and the various forms of hot bread are not readily digested, because their starch has not been thoroughly cooked. Persons with weak digestion should eat them but rarely, if at all.

Pancakes, doughnuts, pies, and cakes are all foods that we should eat in but small amounts. Often their starch has not been long enough cooked to be readily digestible. Then, too, being soft in texture, they are likely to be swallowed before they are well chewed. Since all grain foods contain much starch, they need to be well chewed. This is especially true of such rich foods as pie and cake.

All girls should learn to make good bread. With a patent bread mixer to use in kneading the dough, this can be done more quickly and with less bother than it formerly could. Home-made bread should be cleaner and more wholesome than that which is bought at the store. It also costs less.

**Breakfast Foods.** — Many breakfast foods are made from grain. Usually they are wholesome and readily digested, because they are thoroughly cooked. Those that are dry enough to compel thorough chewing are especially good.

## POINTS FOR SPECIAL STUDY

1. Flour, corn meal, oatmeal, and rice are among the principal grain foods. All are rich in starch, and have some proteid and valuable mineral salts, but little fat.

2. Foods made from flour and meal need especially thorough chewing because they contain so much starch.

3. Newly baked bread is not so readily digested as bread a day or more old. Toast is the most readily digested form of bread.

4. Children often spoil their good health and good looks by eating too much cake, pie, and similar foods.

## QUESTIONS

1. About what part of wheat is starch? proteid?
2. What other food components in wheat?
3. Compare corn with wheat; oatmeal with wheat.
4. What is said of rice as food?
5. Tell the best way to keep flour or meal.
6. Why are biscuits, muffins, etc., not so readily digested as bread?
7. What is said of pancakes, doughnuts, pies, and cakes?
8. Why is home-made bread better than that which is bought at the store?
9. What is said of "breakfast foods"?

## CHAPTER XI

### THE STORY OF FOOD IN BODY BUILDING

#### OTHER VEGETABLE FOODS

**Peas and Beans.** — Of the vegetables (věg'ě-tâ-blz) commonly used peas and beans have the greatest food value. When ripened and dried, about three-fifths of each is starch and one-fifth proteid. About one-eighth is water. Both also contain valuable mineral salts and a very small amount of fat. When green, peas and beans have not nearly so large a supply of the useful food elements, and when canned, they have still less.

Unfortunately the starch and proteid of peas and beans are surrounded by a tough fiber which is difficult to digest. For this reason, people with poor digestion should eat them but very little, and some should avoid them altogether. It is also well for any one who is ill not to eat them.

Ripened and dried peas and beans should be allowed to soak in water several hours before they are cooked. They should also be cooked for a long time. After such preparation, much of the indigestible part can be

removed by straining. From what is left, a broth can be made that is nutritious and not difficult to digest.

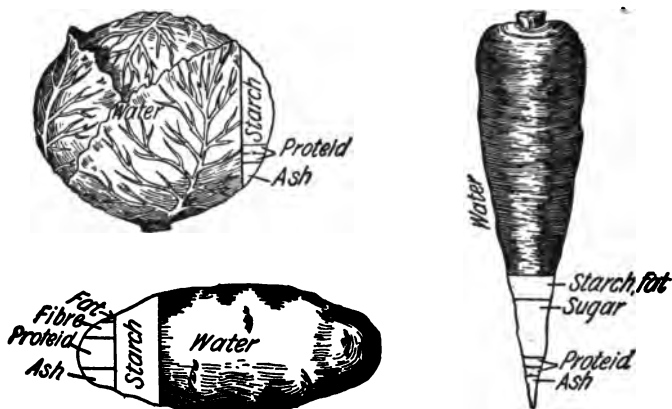
**Potatoes.** — Perhaps no vegetable is more often served at meals than the potato, although it is about three-fourths water. Of the remaining one-fourth, the greater part is starch. It also has valuable mineral salts and a very small part of fat, but little or none of the proteid which helps to make peas and beans so rich in food value.

Some of the food elements are lost in cooking potatoes, if they are not put at once in a very hot place. For this reason, the oven should be very hot for baking them, and they should be placed in boiling water if they are to be boiled. They should not be soaked in water before cooking. Baked potatoes are the most readily digested. Potatoes that are moist and soggy after being cooked are not so readily digested as those that are dry and mealy.

**Other Vegetables.** — Other garden vegetables are valuable chiefly for their mineral salts. Often they are composed of eight or nine tenths water, and the remainder is made up of mineral salts and very small parts of starch, proteid, and fat. Beets are well supplied with sugar.

All green vegetables are thought to be good for the blood. Spinach (spīn'ăj), dandelions, and rhubarb

are also prized for their good effect on the liver. Celery, onions, and carrots, asparagus (ăs-păr'ă-gŭs), and squash are all especially good vegetables. Indeed, many children who eat no vegetables but potatoes would be both healthier and handsomer if they would eat freely of some of the others that have been mentioned.

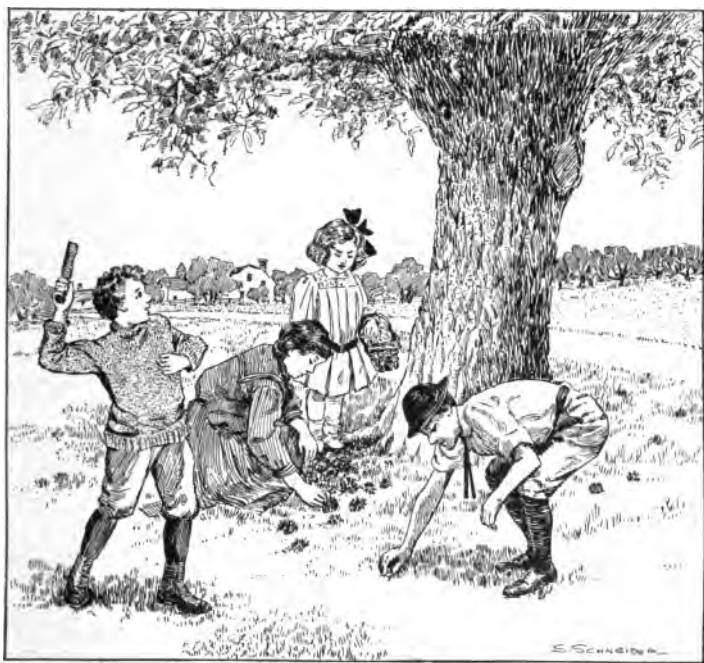


Showing composition of potato, carrot, and cabbage. Ash represents the mineral salts.

**Nuts.** — Nuts are composed of from one-fourth to three-fifths fat. They also have about as much proteid as peas and beans, besides mineral salts. Some nuts are well supplied with starch and sugar. Like peas and beans, nuts are difficult to digest. They should always be thoroughly chewed. Almonds, peanuts, and English walnuts are among the richest in food value. Chestnuts, hickory nuts, and others com-

monly found in this country are also well supplied with the useful food elements.

**Fruit.** — Fruit is made up mostly of water and a small part of sugar. On this account it has little building or



Nutting.

fuel value, but it is highly prized as food because of its delicious taste and the good effect of its mineral salts upon the digestive organs. Both unripe and decayed fruits are harmful and should not be eaten. Canned fruits are pleasant to the taste, and may digest more



easily than fresh fruit, but the good effect of the mineral salts is often lost in the cooking.

Invalids can often digest orange juice when the pulp might not agree with them. Baked apples may be good food for those who cannot digest the uncooked fruit. Bananas may be made more readily digestible by scraping off the fibrous part just under the skin.

### POINTS FOR SPECIAL STUDY

1. Peas and beans are well supplied with both starch and proteid. They are difficult to digest and should not be eaten by invalids.

2. Potatoes are well supplied with starch and mineral salts, but have little of the other food elements. They should be eaten with butter or gravy to furnish the fat, and lean meat or eggs to supply the needed proteid.

3. Nuts are well supplied with fat, proteid, and the other food elements. They should be thoroughly chewed and eaten in small amounts since much of the fiber is indigestible.

4. Fruits, as well as many garden vegetables, are composed largely of water, but are very valuable foods because of the good effect of their mineral salts upon digestion.

### QUESTIONS

1. What causes peas and beans to be difficult to digest?
2. Tell what is said of the food value of peas and beans.
3. Describe how a readily digestible broth can be prepared from peas and beans.
4. What is the chief food element in potatoes?
5. Tell the best way to bake potatoes; to boil potatoes.

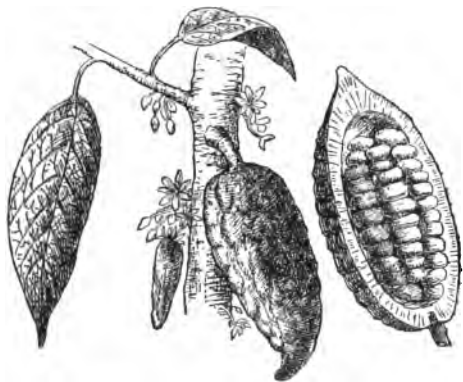
6. Which digest the more easily, baked or boiled potatoes? mealy or soggy potatoes?
7. Name some vegetables that are said to have a good effect upon the blood.
8. Mention some vegetables that stimulate the liver.
9. Tell some of the food elements found in nuts.
10. Name some nuts that are the richest in food value.
11. Why is fruit highly prized as food?
12. What kind of fruit is quite sure to be harmful?
13. Tell what is said of canned fruits.

## CHAPTER XII

### THE STORY OF FOOD IN BODY BUILDING

#### DRINKS

**Cocoa and Chocolate.** — Besides water and milk the liquids most commonly drunk at meals are coffee, tea, cocoa, and chocolate. Of these only the latter two have any real food value. They are both made



Cocoa plant.

from cocoa seeds which are rich in fat, and are also well supplied with proteid and starch. Cocoa contains less fat than chocolate, and is more readily digested.

#### Coffee and Tea.

— From the pleasing aroma of coffee and tea, many think them rich in the useful food elements. This is not true. Both are stimulants, but furnish no building or fuel materials except the milk and sugar that

may be used for flavoring. A stimulant is something that increases the activity of the brain, heart, or some other organ for a time. Many medicines are stimulants. As a rule, it is unsafe to take any stimulant unless advised to do so by a doctor.

**Coffee and Bread a Poor Breakfast.** — Toast and milk only, or toast and cocoa, might be eaten for breakfast, and one would be fairly well strengthened for a morning's work. But toast and coffee, or toast and tea, furnish altogether too little strength for long-continued work or play. School physicians often find that the usual breakfast of pale, weak, nervous children is toast or bread and coffee. A few breakfasts of the right sort quickly start such children on the road to health and strength. We should care too much for our bodies to allow them to start a morning's work so poorly furnished with food that gives strength.

**Children and Tea or Coffee.** — All physicians agree that children should not drink either tea or coffee. No little folk who want to be as strong and rosy-cheeked as they can will be so foolish as to use either of these stimulants. Besides water, the very best drink for them is milk, and the next best is cocoa. They are the best, too, not only because they supply the food elements the body needs, but also because they taste exactly as well or better when we have got into the habit of using them.

**Alcoholic Drinks not Food.** — Beer, wine, brandy, whisky, and other alcoholic drinks are also stimulants and not food. Some people think these liquors help them to work better. Years ago Benjamin Franklin proved to some London printers that water drinkers work faster and lift more than beer drinkers can. To-day athletic teams in this country are not allowed to use alcoholic drinks during their training season. Why not? Because years of experience have proved that the athletes who do without such drinks can be depended upon for the best work.

**Alcohol and Warmth.** — Some people imagine that alcoholic drinks help to make them warm. They do cause more blood to come to the surface of the body, and so they seem to increase one's warmth. In fact, however, heat radiates from the surface of the body more quickly than it otherwise would, and so in the end they are colder. Explorers have found that they can endure the intense cold of the polar regions far better without alcoholic drinks. Surely no testimony on this question could be stronger than theirs. Hot milk, cocoa, hot lemonade, and good nourishing food are the best heat producers.

**Alcohol and Health.** — There are some who think that alcoholic drinks aid in the digestion of other foods. On the contrary, there is good proof that they retard digestion. And that is not their only bad effect, for



Athletes do the best work without alcoholic drinks.

the heart, arteries, liver, and kidneys are all diseased in time through their use. Physicians have also found out another important fact. Persons who do not use such drinks are much more likely to get well from serious diseases than those who use them. They are also much more likely to recover from surgical operations.

**Alcohol and the Brain.** — The worst result from such drinks, however, is that they so affect a person's brain that he loses control both of his muscles and his will. Because of the lost control of his muscles, he staggers. On account of the lost will power, he may be brutal or commit crime.

**Alcohol and the Appetite.** — Of course no one expects to become a drunkard at the time the habit of using liquor is started. If a person could look into the future and see himself like the staggering objects he looks upon with pity or contempt, nothing could hire him to start. "They must have been very weak," he thinks. "I am too strong ever to become like that." But in this lies the most dread danger of alcohol. It so affects the tissues of the body as to create an irresistible (ir' rē-zīst' ī-bl) appetite for itself. Not only the weak and ignorant, but also many of the strongest and best educated have become its victims.

**Alcohol and Usefulness.** — The records of prisons show that drink was the beginning of the disgrace of most of their inmates. Insane asylums and homes

for deserted children record the same sad story. The charity societies of cities number the wives and children of drunkards among the most numerous of their charges.

A census of the unemployed in any city would show how much the strong drink habit has to do with the loss of positions. Workmen need to be on time and in the places where they are wanted each day. They have to be trustworthy, and both reliable and clear-headed in case of an emergency (ě-měr' jěn-sŷ). Drinking, carousing, and the loss of sleep that attend them, prevent one from being his best in any of these respects. Indeed, this is so generally recognized that in many places requiring special honesty and ability, only men who do not use alcoholic drinks are employed.

Fortunately the sentiment against using intoxicating drinks is rapidly growing. No doubt the terrible loss of property and manhood resulting from the habit is being more plainly understood. The pathos of sad-faced mothers and pinched, poverty-stricken children is also having its effect. The chief reason, however, is the increasing desire to achieve the greatest possible joy and usefulness in life. The best possible health of body and mind is essential to the greatest happiness and highest service. Thoughtful people are realizing more strongly every day that burdening the body with



liquors that have no food value is, to say the least, a serious hindrance and handicap. The younger we are when strongly impressed with this great truth, the happier and more useful we shall be.

History tells how nobly our country aided Cuba when Spain was causing such ruin and suffering in that beautiful island. How proud even very young boys would be to fight in such a cause! Alcoholic drinks produce far more loss of property and suffering in our country every year than Spain caused in Cuba. No boy or girl is too young to battle against this greatest foe of home and country. The best way to be good fighters in this splendid cause is never to use intoxicating drinks ourselves. The next best is to do what we can to discourage their use by others.

#### POINTS FOR SPECIAL STUDY

1. Coffee and tea are simply stimulants and not food. Children should not drink either, since they cause nervousness and other weakness.

2. A breakfast of coffee or tea and toast or bread does not furnish enough strength for a morning's work. Such breakfasts are the cause of much ill health.

3. Cocoa and chocolate are both rich in the useful food elements. Cocoa is more readily digested than chocolate.

4. Alcoholic drinks are simply stimulants and not food. They cause drunkenness; create an appetite for themselves; and lead to crime, disgrace, poverty, and unhappiness.

5. Alcoholic drinks do not help people to work better, nor do they aid in warming any one who is cold. They retard

digestion, and in time cause serious diseases of the heart, arteries, liver, kidneys, and other organs.

6. The use of liquor is the most frequent cause of the loss of work. In many positions of trust no one who uses intoxicating drinks can be employed.

### QUESTIONS

1. Tell why cocoa and chocolate are better drinks than coffee and tea.

2. What is a stimulant? Only when, as a rule, should stimulants be taken?

3. Explain why coffee and toast or bread, without other food, make a poor breakfast.

4. Besides water, what are the two best drinks for children?

5. Why are athletic teams not allowed to use alcoholic drinks during their training season?

6. Give two good reasons to prove that alcoholic drinks do not aid in making any one who is cold, warmer.

7. What effect have alcoholic drinks on digestion? What organs of the body do they injure?

8. Tell the cause of drunkenness and its effects.

9. Tell why it is unsafe to begin the liquor-drinking habit.

10. What do the records of prisons, orphans' homes, insane asylums, and charity societies show?

11. Why does the strong drink habit cause the loss of work?

12. What is causing the rapid growth in sentiment against the use of intoxicating drinks?

## CHAPTER XIII

### THE CHIEF MISTAKES IN THE CHOICE OF FOODS

**Candy.** — The chief mistake many children make, as far as food is concerned, is in eating too much candy. It is sold so cheap and is so temptingly displayed in store windows. Then, too, it is the present that visitors, and even members of the family, most commonly give, since children are known to be so fond of it.

Of course no visitor or relative would thinkingly injure a child's health. Few children would willingly spend pennies for candy, if they knew that they were thus helping to make themselves less fond of play and study, and less able to do their best at anything. The thought that they were aiding in bringing about headaches and other discomfort, or even that they were helping to make both their teeth and complexion less beautiful, would be enough to prompt most children to better sense.

The great trouble is that neither children nor their elders stop to consider these facts. Even if others forget, let us remember, then, that while a little sweet for dessert at meals is good food, eating candy between

meals, or eating much candy at any time, is one of the surest ways to lose health and good looks. Think of trading the satisfaction of being and looking and doing our best, all the time, for the few moments' pleasure that is got from eating sweets! Surely few will knowingly be so foolish.

**Breakfast.** — The bad practice of eating only toast or bread and coffee for breakfast has already been spoken of. A breakfast of pancakes, butter, and sirup or sugar is also a poor one. The pancakes, as we have learned, are not readily digested. Then such a breakfast furnishes too much sugar and too little proteid. Eggs and toast or bread and a glass of milk, with some breakfast food, fruit, and a cup of cocoa to satisfy the craving for sweet, make the best breakfast.

**Luncheon.** — Children often take to school a luncheon of bread and butter with jam or jelly, pickles, cake, and a bottle of cold coffee. Egg, lettuce, or meat sandwiches for the hearty part of the meal, fruit and a little candy, nuts, or cake for the dessert, with milk in place of the coffee, will please the taste, and furnish materials to develop both strength and beauty of the body. If one is at a school where a cup of broth can be bought, it is an addition well worth while. For luncheon or supper at home, hot soup, followed by a salad with bread and butter, and fruit, nuts, and cocoa for dessert, make a meal that is delicious and strength-giving as well.

**Salads.** — Much can be said in praise of the simple salads. A most delicious one is made of lettuce, celery, fruit, and nuts, with olive oil or cream dressing. Salad of lettuce and eggs alone with dressing is both nutritious and much relished, and those of potato and various vegetables are also well liked. All are inexpensive.



Children lunching.

sive, and may well be used in place of meat at luncheon or supper. Baked potatoes and macaroni with cheese are also an excellent substitute for meat at these meals.

**Foods to Prevent Constipation.** — Olive oil, too, deserves a regular place at meals. Not only is it a

good fuel food, but it is also an excellent aid in keeping the bowels from becoming constipated. Plenty of fresh fruit, stewed prunes, and such vegetables as spinach and onions will also help in keeping the bowels in a healthful state. Graham and whole wheat bread are also excellent aids to the same end.

### POINTS FOR SPECIAL STUDY

1. It is not alone the taste of food, but its value to our bodies, that should be considered in preparing meals.

2. It is not the amount of food that we eat, but what we digest, that really counts for warmth and strength to our bodies.

3. There are plenty of simple foods that are rich in body-building and fuel materials, and at the same time readily made use of by our digestive organs.

4. As a rule, fried foods are difficult to digest.

5. By using a little judgment in our choice of foods, a free movement of the bowels can be had daily without the use of medicines. This will count much toward keeping well and strong.

### QUESTIONS

1. How do children often help to make themselves less fond of play and study and less able to do their best at anything?

2. Tell one of the surest ways to lose health and good looks.

3. Why do pancakes, butter, and sirup make a poor breakfast?

4. Tell some foods which furnish a breakfast that will both nourish the body well, and satisfy the craving for sweet.

5. Mention some foods that make a poor luncheon; some that make an appetizing and nutritious luncheon.

6. Tell what is said of the food value of salads.

7. Give two important facts about the food value of olive oil.

8. Mention several foods that aid in keeping the bowels from becoming constipated.

## CHAPTER XIV

### THE STORY OF AIR IN BODY BUILDING

#### THE NEED FOR PURE AIR

**Air and Food compared.** — From babyhood we have heard it said, “You must eat to be strong.” We can plainly see, smell, and taste food, and, as a rule, can judge whether it is fit for use. Our meals have to be prepared, and we must make some effort in eating them. Naturally (năt’û-răl-ÿ), then, the fact that food is very necessary to our bodies is well understood.

Air is breathed in and out of our lungs several times a minute. We cannot handle it as we can food, nor do our senses so readily tell whether it is fit for use. It requires neither cooking nor serving. The breathing muscles work on and on, day and night, without any effort of the will. For these reasons many think little or nothing about the air they breathe.

**Value of Air.** — Yet it is not hard to understand the great value of pure air to the body. Why is drowning not possible while a person’s nose is above water? Simply because he can breathe. The air supply is



cut off when the nostrils go under water, and life is soon ended, if they are kept there. Close the mouth tightly, and at the same time press the nostrils firmly enough together to stop the current of air. Why must one of these air passages soon be opened? Because the body can be comfortable only a few seconds without a fresh supply of air.

Now if we had to eat food every few seconds of the day, we should certainly be careful to use that which would be best for our bodies. Very likely we should also take the greatest pains to have it just as clean and pure as possible. We should surely be just as careful about the air we breathe. Without doubt some good sense in this respect may add much to the beauty and usefulness of our bodies, as well as to our health and happiness.

**Pure Air.** — All air looks about the same to us. Yet, as to fitness for use in our bodies, it differs greatly. Our bodies need pure air. Besides some watery vapor, pure air is composed of the three gases, nitrogen, oxygen, and carbon dioxide (*kār'bōn dī-ōx'īd*) which is often called carbonic acid gas.

A little less than four-fifths of pure air is nitrogen. About one-fifth is oxygen. Only about one part to every twenty-five hundred parts of air is carbon dioxide. The two gases that we need most to learn about are oxygen and carbon dioxide.

**Oxygen.** — Oxygen is the element of air that unites with the carbon in other substances to cause burning or combustion (kõm-büs'chũn). Why does opening the lower draft of a stove or furnace make the fire burn more briskly? Because more oxygen reaches the fire pot to unite with the carbon of the coal or wood. If the drafts are kept closed, or if the ashes prevent oxygen from reaching the fuel; the fire soon goes out.

Oxygen is also constantly uniting with the carbon of metal and wood that are exposed to air. This union, however, is slow and does not cause flame as it does in the stove or the furnace. It simply makes the metal rust or the wood decay. The oxygen of the atmosphere is diluted or weakened by the presence of so much nitrogen. If it were not, oxygen would unite with carbon too briskly, and cause fires where they were not wanted.

Of what benefit to us is the oxygen of the air breathed into our lungs? It unites with the carbon in the tissues of our bodies, to produce the heat that keeps us warm and the energy that gives us the power of motion. This is one of the reasons why we cannot get along without air a single moment.

**Carbon Dioxide.** — When oxygen unites with carbon in a stove or furnace, besides heat there is produced a disagreeable gas which we are careful to have pass up the chimney. The union of oxygen and the tissues of

our bodies, besides causing heat, also produces a gas called carbon dioxide.

We have already learned that pure air contains about one part of carbon dioxide to every twenty-five hundred parts of air. *Two parts of this gas to twenty-five hundred parts of air is the most that it is safe to have in any air we breathe. Without doubt five and one-half parts of carbon dioxide to twenty-five hundred parts of air is dangerous to breathe.* By thinking how quickly five can be counted, and how long it would take to count twenty-five hundred, one can readily understand how very small an amount of carbon dioxide will make the air of a room injurious to breathe.

**The Air Breathed Out.** — The blood carries oxygen from our lungs to every part of the body. It also brings back carbon dioxide from the tissues to the lungs, from whence it is carried in the air breathed out. Indeed, the air breathed out contains *one-fifth less oxygen, one hundred times more carbon dioxide, and twice as much watery vapor* as the air breathed in. Along with this watery vapor, many particles of dead tissue also come. These have an offensive smell and may contain disease germs.

An exchange of carbon dioxide, watery vapor, and fetid matter for oxygen takes place every time human beings or other animals breathe. Oil lamps, gas jets, candles, in fact, any artificial lights in common use but

electric lights, consume much oxygen and produce carbon dioxide. So one can readily see that the air of any room may become unfit for breathing, unless pains are taken to prevent it. How this may be done, we shall see in the next chapter.

### POINTS FOR SPECIAL STUDY

1. We can get along but a few seconds without air. The purer the air, the better it is for our bodies.

2. Besides some watery vapor, pure air is composed of about four-fifths nitrogen, one-fifth oxygen, and one part carbon dioxide to every twenty-five hundred parts of air.

3. Oxygen unites with the tissues of our bodies to produce heat and energy.

4. The blood takes oxygen from the air breathed into our lungs, and carries it to all parts of the body.

5. Besides causing heat and energy, the combustion of oxygen and the tissues of the body produces carbon dioxide. The blood takes this gas back to the lungs from whence it is carried in the air breathed out.

6. Two parts of carbon dioxide in twenty-five hundred parts of air is the most that it is safe to have in the air we breathe. Five and one-half parts of carbon dioxide to twenty-five hundred parts of air is dangerous to breathe.

7. The air breathed out contains one-fifth less oxygen, one hundred times more carbon dioxide, and twice as much watery vapor as the air breathed in.

8. The watery vapor of the air breathed out from the lungs contains particles of dead tissue. These have an offensive smell, and may contain disease germs.

9. All artificial lights except electric, consume oxygen and give out carbon dioxide.

## QUESTIONS

1. Tell why it is natural to think of food as necessary to the body.
2. Explain why many think little about the air they breathe.
3. Give some proofs that our bodies must have air every moment.
4. Besides watery vapor, what three gases does air contain?
5. Pure air contains what part of nitrogen? of oxygen? of carbon dioxide?
6. How is heat produced in a stove or furnace?
7. What may cause a fire in a stove or furnace to go out?
8. Tell what causes rust of metals and decay of wood.
9. What dilutes oxygen? What would be the effect if it were not diluted?
10. How are heat and energy produced in our bodies?
11. What poisonous gas is also produced by the combustion of oxygen and carbon in our bodies?
12. What is the greatest amount of carbon dioxide that it is safe to have in the air we breathe?
13. What amount of carbon dioxide is it dangerous to have in the air that we breathe?
14. What carries oxygen from the lungs to the body, and brings back carbon dioxide to the lungs?
15. Tell how the air breathed out from the lungs differs from the air breathed in.

## CHAPTER XV

### THE STORY OF AIR IN BODY BUILDING

#### VENTILATION

We know that oxygen is being constantly used up and carbon dioxide produced by combustion in the world about us. Every time human beings or other animals breathe, oxygen is taken from the air, and carbon dioxide is given back. It is dangerous to breathe air that contains only five and one-half parts of carbon dioxide to twenty-five hundred parts of air. How does it happen that the air, in great cities at least, does not become unfit for our use?

In the first place, plants and trees in daytime take in carbon dioxide and give out oxygen. Secondly, when air is warmed, it expands and becomes lighter. Naturally, then, it rises, and cooler air rushes in to take its place. Out of doors this shifting and changing of great masses of warm and cool air are constantly taking place. This, together with the vastness of the atmosphere, causes out-of-door air, as a rule, to be pure.

It is air inside our homes and other buildings in which we work or study, that we must take pains to keep

pure. In warm weather, this can be easily done through open doors and windows. In our bedrooms at night, open windows will serve this useful purpose in any season. Keeping a room or building supplied with pure air is called *ventilation*.

**Ventilation of Large Buildings.** — In modern school-houses and similar buildings each room has an opening through which pure air is forced in cool weather, and another through which foul air passes out. The amount of pure air forced in depends upon what the room is used for and the number of persons it is built to seat. As a rule, about forty cubic feet of air per minute is the amount that it is planned to furnish for each person. When the fans and other machinery in such buildings work perfectly, the air supply is very satisfactory.

**Furnaces.** — In homes, the air supply in cold weather often comes from the furnace. It passes from out of doors, or from the cellar, through the cold-air box into a space over the fire pot of the furnace. Being heated there, it expands and rises through the registers into the rooms above.

The cold-air box of most furnaces is so built that air may be taken either from outside or from the cellar. Of course air from out of doors will be purer than air from the cellar. Wherever it is feasible, we should have the cold-air box of our furnace supplied from

out of doors. Then, if windows in the occupied rooms are opened enough to insure a good circulation of air, we can be well satisfied with the ventilation.

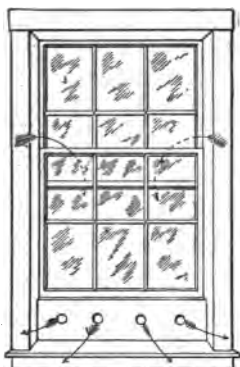
**Steam and Hot Water Heating.** — Some homes are heated by hot water or steam, which comes from the furnace through pipes into radiators which are in the various rooms. In such homes, the air of the rooms is heated by the radiators. No pure air supply, however, is coming from the furnace. On this account, special pains must be taken to ventilate by open windows. Similar care must also be taken in rooms or homes that are heated by stoves.

**Stoves without Pipes.** — Every stove should have a pipe to carry off the gas that is always produced by combustion. Gas stoves without such pipes are often sold. In rooms where such stoves are used, there should be an excellent circulation of pure air. Otherwise the atmosphere of the room will soon become unfit for breathing. It is far better to spend a little more money and buy a stove having a pipe to carry off the injurious gas.

**Fireplace.** — A room heated by a fireplace is likely to be well ventilated. The air which is being heated by the fire expands and passes up the chimney, the cooler air of the room rushing in to take its place. Thus the atmosphere of the room is constantly kept in circulation.

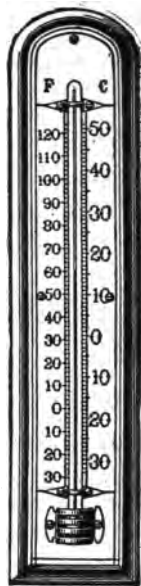


**Ventilating by Windows.** — In ventilating by windows alone, it is well to have an opening both at the top and at the bottom. Then the warm air will pass out at the upper opening, and cooler air will come in at the lower. It is far better to have several windows open in this way than to have one open wide.



Ventilating in cold weather, keeping the lower sash of a window raised by a board.

A device like the one in the illustration on this page is excellent for ventilation in very cold weather. This admits air between the upper and lower sashes, thus avoiding drafts. In all ventilation, care should be taken to avoid strong drafts, for sitting in a draft often causes a cold. The aim should be to have a free circulation of air. Usually this can be done without causing injurious drafts, if windows and transoms are wisely adjusted.



Thermometer.

**Temperature of Living Rooms.** — Not only should the air of occupied rooms be kept pure, but it should also not be allowed to become too hot or too dry. A

temperature of from  $65^{\circ}$  to  $68^{\circ}$  is the best for any room in which people are sitting, and it should not be allowed to rise above  $70^{\circ}$ . If it does, the people in the room are likely to feel dull and restless. Headache and other unpleasant feelings also often result. Then, too, one is apt to catch cold more easily on going out of doors, because the air is so much cooler than that of the room.

Notice the thermometer of the room in which you are sitting. Tell how many degrees its mercury registers. Take it in your hand, and, if feasible, through the use of heat and cold, make it register  $65^{\circ}$ ,  $68^{\circ}$ , and  $70^{\circ}$  in turn. You will be interested to see how quickly the mercury will rise and fall to show the change in heat.



Writing the daily temperature record.

**Temperature Record.** — Much poor work and bad conduct in school have, no doubt, been caused by too warm air. In every schoolroom, the thermometer

should be examined at least once an hour, and the temperature written on the blackboard. It should be the duty of certain pupils to attend to this important record. If the temperature should be found to be above 68°, the atmosphere should be promptly cooled. Reasonably cool, pure air is one of the greatest aids to good attention and to successful school work.

**Too Dry Air.** — Air that is too dry takes up moisture from the inside of the mouth and nose, thus causing soreness and colds. Every furnace has a storage place for water which should be filled daily. Even when this is kept well filled, the air which passes to the rooms above will often be too dry. If a small basin of water is kept inside the registers of the much-occupied rooms, the air in passing will usually take up the moisture it should have. A basin of water should also be used to furnish moisture to the air of stove-heated rooms. When open windows are used for ventilation, there is little likelihood of too dry air.

**Chief Aim of Ventilation.** — The chief aim of ventilation is to provide for a circulation of pure air. When we are to be for some time in a room with several other persons, we should look out for its proper ventilation just as quickly as we should look for a seat. In fact, pure air to breathe is far more important than a comfortable seat in which to sit. Standing a very long time

makes one very tired, of course; but breathing impure air sows the seeds of discomfort and disease.

**Unclean Air.** — Upon coming from out of doors into a poorly ventilated room that has been occupied for some time by several people, we at once notice the impure, ill-smelling atmosphere. Those in the room may not have noticed the foul air at all, for their noses became used to it, little by little. A newcomer, however, wants to open doors and windows at once, for he cannot endure the disgusting air.

Everybody shrinks at the thought of touching or tasting anything foul, decayed, or diseased. Yet many breathe air that has been made foul by waste particles of tissue breathed out by others, without even a thought of its unclean condition.

Any one who happens to get near enough to smell the offensive breath of another, will quickly withdraw. Yet he will continue to breathe unpurified atmosphere containing particles that help make breath unpleasant, with no concern whatever as to the foul air which he is taking into his lungs.

Often persons who are the most particular about handling unclean things they can see, are the first to complain of open windows on account of their fear of drafts. If they could see or even smell the unclean condition of the air, they would be the most earnest in asking for ventilation, with little thought of drafts.

**Ventilating for Company.** — It will often happen that too many people will be seated in a room of our homes. Pains should be taken to air the room thoroughly before the guests arrive. Then if windows are properly arranged at the start, a good circulation can usually be had without injurious drafts. Sometimes a room may be too crowded for such an arrangement to be possible. In such cases windows should be opened wide, now and then. In these intervals the people in the rooms can keep from catching cold through exercise or extra wraps.

**Ventilating Facts worth Remembering.** — The following should be written in our minds and never forgotten. No matter how clean, pure, and pleasing the persons who are in a room with us may be, each one is using up oxygen and breathing out carbon dioxide and waste matter. In well-ventilated rooms, the air will purify itself. In poorly ventilated rooms, all will soon be breathing air containing waste tissue and possibly disease germs from the bodies of others, to say nothing of the poisonous carbon dioxide.

Here, then, is a matter about which it is worth while to be particular. Let a good circulation of air be the first thing to look out for in any room in which we are to remain for a long time. The lack of good ventilation should be at all times a good excuse for leaving any room or assembling place. Cleanliness, as well as

health, will certainly furnish the best of reasons for so doing.

### POINTS FOR SPECIAL STUDY

1. Out-of-door air is, as a rule, pure. It is indoor air that we should take pains to keep fresh and pure.

2. The windows and doors of occupied rooms should be kept open in warm weather, to keep the air as nearly as possible like the out-of-door atmosphere.

3. In both warm and cold weather our sleeping rooms should be ventilated by open windows. A room having two or more windows is always better than a room with but one window.

4. In ventilating by windows, it is well to have an opening both at the top and at the bottom. Several windows arranged in this way are better than one or two wide open.

5. The temperature of any occupied room, except a sleeping room, should be kept at from 65° to 68°, and should not be allowed to rise above 70°.

6. Every stove should have a pipe to carry off the poisonous gases produced by combustion.

7. We cannot see, and often do not smell, the foul air in a poorly ventilated room; yet it may be as unfit for breathing as decayed food for eating or sewer water for drinking.

### QUESTIONS

1. What effect does heating have upon air?
2. What is said of the purity of outside air?
3. Define ventilation.
4. How may a room be well ventilated in warm weather?
5. How should our bedrooms be ventilated in all seasons?
6. In cold weather, what does the supply of pure air in homes often come from?
7. What is said of cold-air boxes?

8. How does a fireplace help in ventilating a room?
9. How should a room heated by stoves be ventilated in cold weather?
10. Why should all stoves used in a home or office have pipes connected with the chimney?
11. What is the best temperature for an occupied room?
12. What is the highest point the temperature should be allowed to reach?
13. Tell how a temperature record should be kept in a schoolroom.
14. What bad effect has too dry air?
15. Tell how the air of occupied rooms may be kept from becoming too dry.
16. Tell why it is more important to look out for the good ventilation of a room we enter than to look for a seat.
17. Why do persons who have been for some time in a poorly ventilated room, not notice the foul air?
18. How will the air of such a room affect a newcomer?
19. Tell why people who are particular about unclean things they can see, are often not particular about the purity of the air they breathe.
20. How may drafts often be avoided in ventilating a room?
21. In what rooms is it well to open windows wide every now and then to change the air?
22. No matter how clean, pure, and pleasing persons may be, in what way does their breathing affect the atmosphere of a room?

## CHAPTER XVI

### THE STORY OF AIR IN BODY BUILDING

#### BREATHING

We have learned some valuable facts about the use of pure air to our bodies. So valuable that we shall—it is to be hoped—hereafter take special pains to have the air we breathe as pure as possible. The important thing, now, is to make sure that we have the habit of taking an abundant supply of pure air into our lungs. “That is easy enough,” one might say. “All that is necessary is to keep on breathing.”

Very likely that might be true if everybody breathed well; but, unfortunately, such is not the case. Because of incorrect position, tight clothing,



Showing portions of the nasal pas-  
sages, mouth, throat, and windpipe.



and other causes, many people do not take as much air as they should into their lungs when they breathe. Before we consider the different ways of breathing, however, let us get acquainted with the organs of the body through and into which air passes.

**The Breathing Organs.** — Air comes into the nose or mouth, and passes through the pharynx (făř'ĩnks), larynx (lăř'ĩnks), trachea (tră'kě-ă) or windpipe, bronchi (brŏn'kī), bronchial (brŏn'kĩ-ăl) tubes, and bronchioles (brŏn'kĩ-ŏlz) into the air cells of the lungs. (See illustrations, pages 87 and 90.) The entire inner surface of this tract has a membrane lining which secretes a fluid called *mucus* (mũ'kūs).

From the mucous membrane of the air passages there grow little hairs called *cilia* (sĩl'ĩ-ă). These aid in stopping dust and bacteria. The moist mucous membrane likewise stops dust and bacteria, and is said to make the latter harmless. When one has a cold, the secretion of the air passages increases in amount, being whitish and watery at first, but later on thicker and of a darker color.

The nose has two divisions, the *right nostril* and the *left nostril*, that are separated by a partition (păř-tĩsh'ũn).

The *pharynx* is the large cavity at the base of the tongue, formed by the joining of the nose passage and the mouth. From the front and upper part of the

pharynx the *Eustachian* (ū-stā'kī-ăn) tube leads to each middle ear.

**Tonsils.** — On each side of the root of the tongue is an oval body called a *tonsil*. Its use is unknown. *Tonsilitis* (tŏn-sil-ī'tis), a disagreeable sore throat, is caused by inflammation (in-flām-mā'shŭn) of the tonsils. Tonsils sometimes become permanently enlarged, and have to be removed by a surgeon.

**The larynx** looks like an enlargement of the upper end of the trachea or windpipe. It is a tube about two inches long, and is made of two large pieces of cartilage and several smaller ones. The large cartilage forms the "Adam's apple" which can be felt, and sometimes seen, in the neck just under the chin. The vocal cords are attached to the cartilage of the larynx.

**The glottis** is the narrow, slit-like opening from the pharynx into the larynx.

**The epiglottis**, a small, triangular lid, fastened just in front of the glottis, serves the useful purpose of preventing food from entering the larynx. Usually it is erect, and allows air to pass freely; but when food and drink are swallowed, it covers the larynx, even without our willing it.

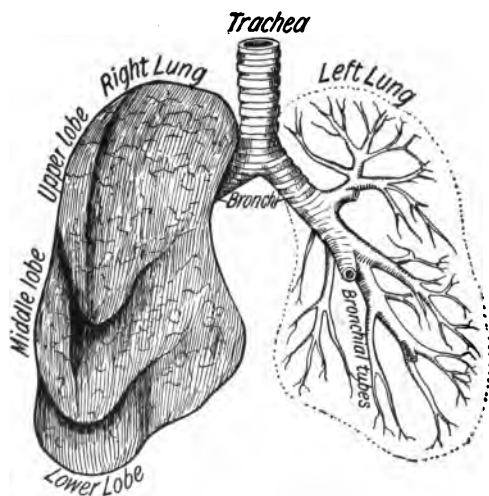
**The trachea** or **windpipe** is a tube about four inches long, extending from the larynx into the thorax or chest. The trachea is strengthened by a number of rings of cartilage. These are incomplete at the back,

so that the esophagus may have plenty of room to expand when food is swallowed.

**The bronchi** are the two parts into which the trachea divides in the chest. One of these parts alone is called a *bronchus*.

**The bronchial tubes** are the branches or subdivisions of the bronchi.

**The bronchioles** are the small divisions or branches of



Showing trachea, right lung, and bronchial tubes of left lung.

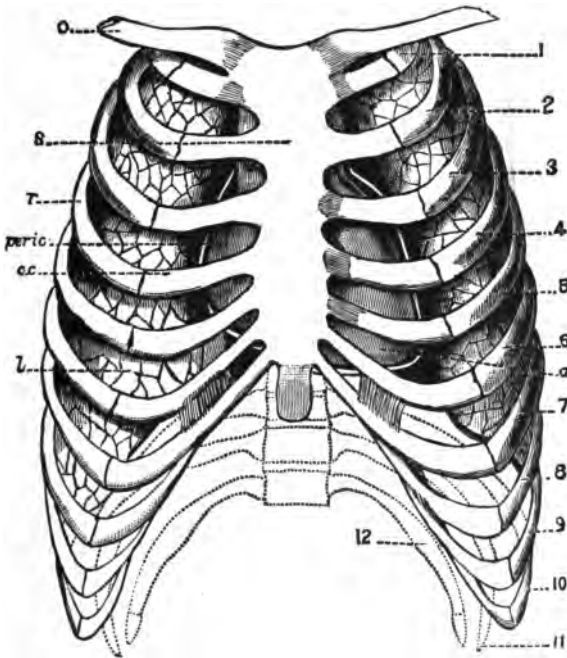
the bronchial tubes. Each bronchiole ends in a group of *air cells*.

**The lungs** are composed of the bronchi, many bronchial tubes, numerous bronchioles, and thousands of air cells. The top

or *apex* (ā'pěks) of each lung is just under the collar bone, and the *base* of each is at the base of the chest, and just above an important muscle called the *diaphragm* (dī'ā-frām). Both lungs are covered with a membrane called the *pleura*, which also lines the

chest. The walls of the air cells of the lungs are thin as paper and very elastic, and have a network of blood vessels.

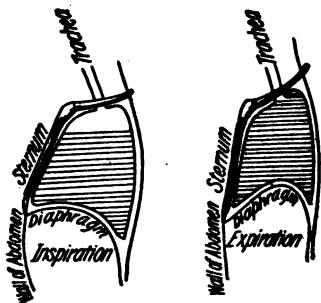
The chest cavity in which the lungs are situated is bounded by the ribs, spine or backbone, the sternum or



The thorax or chest showing ribs, sternum, lungs, and heart.

breast bone, and below by the strong muscle called the *diaphragm*. Between the ribs are the *intercostal* (in-tēr-kōs'tāl) *muscles*.

**Act of Breathing.**—Breathing is caused by the alternate expansion (ěks-păn'shŭn) and contraction (cŏn-trăk'shŭn) of the diaphragm and the intercostal muscles.



Showing positions of the diaphragm, sternum, and walls of the abdomen in inspiration and expiration (Zuppke).

The atmosphere is so heavy that its pressure is fifteen pounds to the square inch. When the expansion of the diaphragm and the intercostal muscles enlarges the chest cavity, the pressure of the outside atmosphere forces enough air into the lungs to make them expand to fill the increased space.

The contraction of the diaphragm and the intercostal muscles which follows makes the chest cavity smaller and so forces the air out. The illustration above shows the appearance of the chest cavity and diaphragm both at the time air is taken into the lungs and when it is forced out.

Breathing in is often spoken of as inhaling or inspiring, and the act is called inspiration (ĭn'spĭ-ră'shŭn). Breathing out is called exhaling or expiring, and the act is spoken of as expiration (ěks'pĭ-ră'shŭn). Breathing in and out, or an inspiration and an expiration, constitute respiration (rĕs'pĭ-ră'shŭn). When

a doctor says that a patient's respiration is twenty, he means that the patient breathes in and out twenty times a minute.

We can now understand that the amount of air taken in at a breath, depends upon how much the chest cavity is enlarged. The increase in the size of the chest cavity depends largely upon how much the diaphragm is forced down in the act of breathing.

**Rhythmic Deep Breathing.** — If we sit and stand erect, with the chest out and the abdomen in, the diaphragm will expand freely, and we can feel it crowding down the organs of the abdomen, which go back to place as the diaphragm contracts. This alternate motion of the organs of the abdomen can be plainly noticed, and it is one of the best signs of correct breathing. The greater the action of the diaphragm, the greater will be the motion of the abdominal (ăb-dŏm'ĭ-năl) organs. In health this motion will be regular and rhythmic, if one's position is correct.

**Best Position for Breathing.** — The first thing, then, is to make sure of erect position with shoulders back, chest out, and abdomen inclined inward. The second is the deep expansion and contraction of the diaphragm, which is shown by the alternate rhythmic motion of the abdominal organs. These are the habits most important to form for boys and girls who want to be happy and useful. No amount of money can begin

to buy the good looks, good times, and the skill in both play and work, that these habits are sure to bring.

**Causes of Poor Breathing.** — Round shoulders or a stooping position of any kind prevent rhythmic deep



Best habitual position; chest is free to expand and weight is easily shifted from one foot to the other.



Improper position; causes spine to curve to one side, raises one hip and shoulder above the other.

breathing. Sitting or standing with the abdomen inclined outward and the chest inclined inward, keeps the breathing muscles from having their freest expansion. Tight clothing about the chest or abdomen has a similar effect. "Sit and stand erect" and "Do not wear tight clothing" are excellent mottoes for

those who would get the best possible benefit from breathing.

Perhaps one may have already formed the habit of stooping as he sits or stands, sliding down in his seat, or sitting and standing with the abdomen inclined out-

ward and the chest inward. How may such bad habits be broken and the correct ones formed?

**How to gain Correct Position.**—The chief thing is to be sure that we know the correct position, and then



Desk too low.



Slipping down in seat—a poor position.

to keep trying until that is our habit. Exercises to strengthen the muscles of the back will assist, but thought and perseverance (pěr-sě-vēr'-ăns) are the principal aids. It

is easy to understand that childhood is the very best time to cultivate correct position. At that time there is more animal matter than mineral in bones, and so their position is more easily changed than when one grows older, since the amount of mineral matter in bones increases with age.



Correct position.



**Value of Improved Position.** — There are many important things to learn in school. Few, however, can



*From Dr. Mosher's "Hygienic Desks for School Children," Educational Review.*

An adjustable seat and desk as used for writing.

begin to be so valuable as the habit of erect sitting and standing position. A gain of 25% in standing in arithmetic or geography may seem a great deal both to children and to their parents. Yet a gain of 25% in correctness of posture might easily result in a thousand times more benefit.

Another thing well worth thinking about is

that improved position means handsomer appearance. Strength and beauty go with correct position. In the pictures on page 94 notice how much erect position improves appearance. It is right that we should all want to appear as well as possible. Any one who really wants to look his best will keep on trying for correct posture until that is his natural habit. If, besides, he is careful to breathe as pure air as possible, and forms the habit of rhythmic deep breathing as well, his start towards a lifetime of the best health and finest appearance is certainly most excellent.

**How Breathing purifies the Blood.** — Granted, then, that we do fill our lungs with pure air when we breathe.

How is its oxygen exchanged for the carbon dioxide of the blood?

This is very readily explained. The extremely thin tissue of the air cells has a network of tiny blood vessels containing blood made dark by carbon dioxide and other impurities. The tissue is so thin that the exchange of oxygen of the air for car-



Same seat and desk, as used for reading.

bon dioxide and waste of the blood takes place through the walls of the cells. If the thousands of air cells of the lungs were spread out, it is estimated that they would more than cover the surface of the body. Thus we can see how well the blood may be purified in our lungs, if we are only careful to have pure air to breathe, and to form the habit of breathing that will insure our bodies a plentiful supply.

#### POINTS FOR SPECIAL STUDY

1. The important muscle between the chest and the abdomen is called the diaphragm. The muscles between the ribs are called the intercostal muscles.

2. Breathing is caused by the alternate expansion and contraction of the diaphragm and intercostal muscles, which alternately increases and decreases the size of the chest cavity, thus allowing air to come into the lungs and also forcing it out.

3. In deep breathing the diaphragm expands so as to cause a noticeable pressure on the organs of the abdomen.

4. Correct position is essential for the freest and best motion of the diaphragm. Sitting or standing erect with the shoulders back, and chest inclined outward and the abdomen inclined inward, is the correct position for rhythmic deep breathing.

5. In health, one whose posture is correct, can readily notice the rhythmic deep movement of the diaphragm and its pressure upon the abdominal organs. We should not be satisfied with our breathing until this rhythmic deep movement of the diaphragm is our regular habit.

6. The carbon dioxide and waste of the blood is exchanged for the oxygen of the air through the thin walls of the air cells of the lungs.

### QUESTIONS

1. Through what passages does air travel in reaching the air cells of the lungs?

2. With what are these passages lined?

3. Tell what cilia are and state their use.

4. Tell what mucus is and mention its uses.

5. Describe each of the following: (a) pharynx; (b) glottis; (c) epiglottis; (d) tonsils; (e) larynx; (f) trachea; (g) bronchi; (h) bronchial tubes; (i) bronchioles; (j) air cells; (k) the lungs.

6. What is the pleura?

7. What is the apex of a lung? the base?

8. Tell by what the chest cavity is bounded.

9. What is the diaphragm?
10. What are the intercostal muscles?
11. Tell what causes air to come into the lungs.
12. What forces air out of the lungs?
13. Describe the position that is best for deep breathing.
14. What is meant: (a) by inhaling or inspiring air? (b) by exhaling or expiring air? (c) by respiration?
15. What is meant by saying that a person's respiration is twenty?
16. How can we tell if rhythmic deep breathing is our habit?
17. Where and how does the exchange of oxygen for the carbon dioxide and waste of the blood take place?
18. If spread out flat, about how much surface would the air cells of the lungs cover?
19. What are the most important habits to form, if we want to get the greatest possible benefit from our breathing?

## CHAPTER XVII

### THE STORY OF AIR IN BODY BUILDING

#### MOUTH BREATHING AND ADENOIDS

**Use of the Nose.** — The long, narrow passages of the nose were made both to cleanse and to warm the air. The dust, not stopped by the cilia, sticks to the moist mucous membrane lining, and is sent out when the nose is blown. The mucus also arrests bacteria, and makes them harmless.

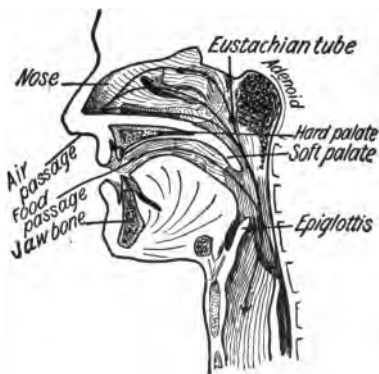
**Mouth Breathing.** — When air is taken in through the mouth, it passes to the lungs far more quickly than when breathed through the nose. For this reason, it is neither so well cleaned nor so well warmed as that which enters through the nose passages. It is also a fact that one can endure breathing poisonous air through the nose much longer than through the mouth. Without doubt, even the very best air is better fitted for use in the lungs, if it comes through the nose passages.

**Reasons for Breaking the Mouth-breathing Habit.** — Suppose a person has been carelessly breathing through the mouth. Why should he form the habit of nose breathing without delay? There are several good reasons. He can run faster and better. He can play :

harder and longer. He will not disfigure his countenance by forming the habit of constantly keeping the mouth partly open. He will not run the risk of becoming partly deaf, or of growing stupid in school through lack of power to give attention. In fact, his health, strength, and appearance will all be improved by breathing through the nose.

**Testing the Nostrils.** — Since we want as full and free a supply of air as possible, we should also be sure that we are breathing through both nostrils. One nostril is often stopped up without being noticed. It is well, once in a while, to press one nostril closed, while we breathe through the other. In this way we can tell if both passages are open and unobstructed.

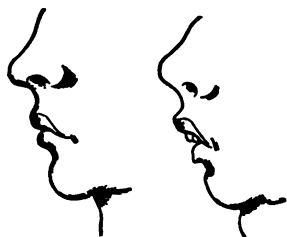
**Adenoids.** — Sometimes mouth breathing is compelled by polypi, adenoids, and other growths in the nose. The most common of these in children is ade-



Showing the location of adenoid growths (Zuppke).

noids. They are spongy growths, which not only prevent air from passing through the nose, but also often interfere with the blood supply to the brain.

**Effects of Adenoids.** — Naturally, then, adenoids cause children to be listless and dull in school. They



Facial expression in mouth-breathing and breathing through the nose.

are also a frequent cause of deafness. Another noticeable effect is the habit of constantly keeping the mouth partly open. In many cases, besides the partly open mouth and deafness, the afflicted person is in the habit of staring in a half-vacant manner.

**Why Adenoids are not removed.** — Even with such marked symptoms, children are often allowed to go for years without having the adenoids removed. The symptoms are so evident that the trouble ought to be easily guessed, yet many parents have nothing done. They seem to take it for granted that it is the child's misfortune to be backward in school and to have delicate health.

This is a great pity, since adenoids can be removed by an operation which is neither painful nor very expensive. Many children have had this operation performed with great satisfaction to all concerned. Indeed the gain in health, standing in school, and good appearance have been so great in many cases as to seem almost a miracle.

Very likely many parents do not know enough of the

symptoms of adenoids to realize that their children have them. And even when convinced of that fact, the possible expense or pain that they imagine connected with all surgical operations, keeps them from consulting a physician of standing. Of course they do not realize how greatly the operation would benefit the future health and success of the child. If they did, no labor or sacrifice to earn the necessary money could possibly be too great.

If one happens to be so unfortunate as to have adenoids, there are few, if any, benefits to look forward to more eagerly than their speedy removal. Perhaps we may know children that seem to have the well-known symptoms of adenoids. If so, how great a service we can perform by telling their parents of the marvelous benefits that have often resulted by having these obstructions to the nose passages removed.

It is a fine thing in this world to be able to be our best, do our best, and look our best, as much of the time as is possible. Any of these desirable conditions is simply impossible, if the nose passages are stopped up by adenoids. This is a fact well worth remembering, not only for our own benefit, but also for that of our friends.

#### POINTS FOR SPECIAL STUDY

1. The nose passages are specially constructed both to cleanse and to warm the air. If we want to be our healthiest



and to play and work our best, we shall form the habit of breathing through the nose.

2. Continuous mouth breathing injures health, and even shortens life.

3. Adenoids are growths that stop up the nose passages. Their presence can often be detected by the habit of constantly keeping the mouth open. They cause dullness of the mind and partial deafness, and also lessen the general health. When removed by a simple operation, all of these defects soon disappear.

4. The *Big Four* in connection with the use of air to the body are Good Ventilation, Breathing through the Nose, Erect Position, and Rhythmic Deep Breathing.

### QUESTIONS

1. Explain the use of the cilia in the nose and other air passages.

2. Tell two uses of mucus in the air passages.

3. Give two good reasons why it is better to breathe through the nose than through the mouth.

4. State two bad effects of continuous mouth breathing.

5. How may we make sure that we are breathing through both nostrils?

6. What are adenoids?

7. Mention several symptoms of the presence of adenoids.

8. What benefits result from having adenoids removed?

9. Tell all the benefits of nose breathing.

10. Tell what is said of adenoids, their effects, and removal.

## CHAPTER XVIII

### THE STORY OF WATER IN BODY BUILDING

#### THE ORGANS OF EXCRETION

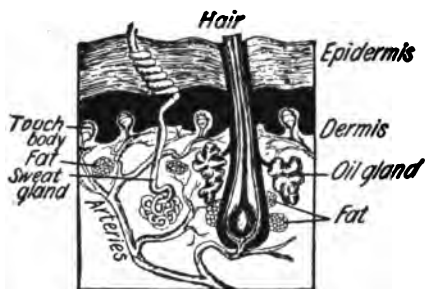
**Amount of Water in the Body.** — It may have been a surprise to find that vegetables, grains, meat, and other foods contain much water. Perhaps it will seem even stranger to learn that two-thirds of the entire human body is composed of the same liquid. Blood is about four-fifths water, and muscle, fat, cartilage (kār'tī-lāj), and even bone, all have a share. When you think that if all the water were pressed out of the tissues of your body, only one-third of your entire weight would be left, you can realize what an important part this common liquid has in body building.

Water is constantly leaving the body in *perspiration* (pēr-spī-rā'shūn) through the pores of the skin, and in watery vapor from the lungs. There is also much water in the urine excreted (ěks-krēt'ěd) by the kidneys.

This loss is made up by the water in the foods that we eat and the liquids drunk during the day. The harder we work or play, the more water the body gives out. Hence the thirstier we become, and the more water we drink. Thirst shows that our tissues

need water just as hunger tells that they need food. Men have lived many days without food; but great discomfort and even death would follow, if one had to go many hours without water.

**The Skin.** — Besides supplying the tissues, water performs two other very useful services for the body.

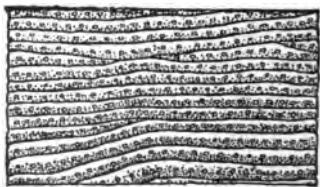


A vertical section of the skin (Newell).

It helps to keep both the outside and the inside clean. The outside covering of the body, the skin, has two layers. The outer and thinner is called the *epidermis* (ěp'ĩ-děr'mís). The

inner and thicker layer is named the *dermis*. In the dermis are two sets of tubes called the *perspiratory* (pěr-spĩr'ă-tō-rŷ) *glands* and the *oil glands*.

**Perspiratory Glands.** — The perspiratory glands are tubes lying deep in the dermis or in the fat underneath. An outlet or duct runs in a spiral manner to the surface of the skin. The body has many thousands of these glands. In fact, it is said that if all the perspiratory glands of a person of aver-



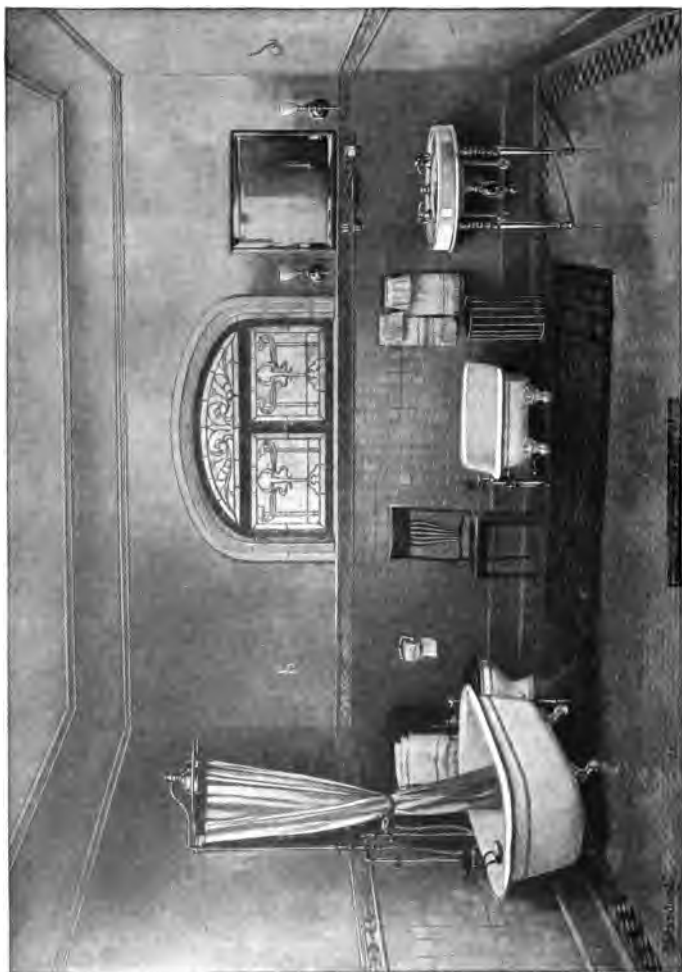
Surface of palm, magnified, showing ridges and pores from sweat glands.

age size were placed end to end, they would reach about twenty-eight miles.

The liquid given out from these miles of glands is called sweat or perspiration (pě-r-spĭ-rā'shŭn). Besides water, it contains poisonous waste that the body must get rid of to keep healthy. On hot days, or when playing or working hard, we can see and feel perspiration on the skin. Perhaps we may not think that it comes from our pores at other times. Nevertheless, the glands of healthy skin are giving out some of this waste and water all of the time, but in such small amounts that it is called *insensible* (ĭn-sĕn'sĭ-bl) *perspiration*.

Like watery vapor from the lungs, perspiration has a disagreeable odor. Though the water evaporates, the waste substances remain on the skin or underclothing. These, together with oil from the oil glands and tiny scales that are shed from the skin, collect and obstruct or interfere with the work of the pores. On this account the lungs and kidneys have more than their share of waste to excrete, or the body is not fully freed of its poisons. As a result, ill health or disease is quite likely to follow.

**Bathing.** — The best way to keep the pores of the skin active and healthy is to bathe the entire body once a day in cold or tepid water, and at least once a week in warm water. Soap should be used with the



Sanitary bathroom.

water to remove the oil and scales. Frequent bathing is necessary, not only to have the pores active and healthy, but also to keep the body clean and free from unpleasant odors.

One of the best forms of bathing is the daily morning sponge or plunge cold bath, followed by vigorous rubbing. Besides cleansing the skin and keeping the pores healthy, it stimulates the circulation of the blood. As a rule, it is a great aid in keeping one free from colds and in generally improving one's health and vigor.

Tepid baths cleanse, but do not stimulate. Warm baths cleanse more thoroughly than either cold or tepid, and should be taken at least once a week. When about the normal temperature (tēm'pēr-ā-tūr) of the body,  $98\frac{1}{2}^{\circ}$ , or a little more, they are often a helpful aid to sleep.

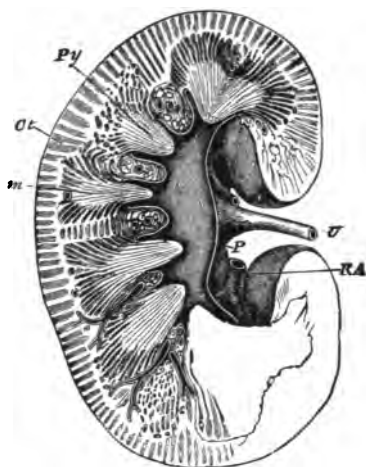
Steam or hot-air baths that cause a free flow of perspiration are excellent to prevent colds, or even to help to get rid of one that is well started. For a person whose work is indoors and causes little perspiration, such a bath, once a week, is one of the very best aids to health. They may be taken at home in a rubber cloth cabinet bath or something similar, or at the public Russian or Turkish baths that are found in most cities.

**The Kidneys.** — The *kidneys*, like the pores of the skin, excrete waste. They are bean-shaped organs

about the length of a finger, and are situated in the back of the abdomen just below the diaphragm. They are composed of thousands of blood vessels and tiny tubes,

so numerous that if placed end to end, they would reach several miles.

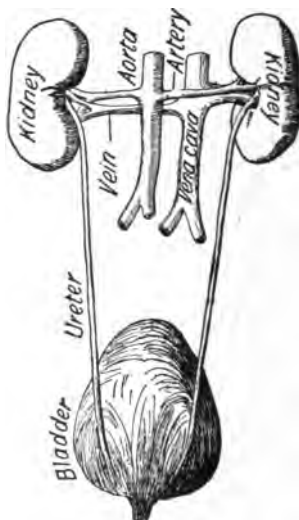
As the blood flows through the kidneys, these tubes take from it water, waste, called urea (ū'rē-ā), and some mineral matter. This fluid,



A longitudinal section of the kidneys (*Huesley*); *Ct*, cortex; *m*, medulla; *Py*, pyramid in the medulla; *P*, pelvis; *U*, ureters; *RA*, renal artery.

which is called urine, flows through a tube, named the ureter (ū-rē'tēr), into the bladder, in which it is stored until it passes from the body.

It is very important that the bladder should be emptied regularly several times a day, for, if it is allowed to become too full, poisonous urea



The kidneys and bladder (*Cheever*).

will not be taken from the blood as it should be. It is also a strain on the muscles of the bladder to hold too large a quantity. To injure oneself by retaining urine too long is, indeed, false modesty. It will rarely occur that relief cannot be easily had, if good sense is used.

**Benefits of drinking Pure Water.** — Drinking freely of water is excellent both for the pores of the skin and for the kidneys. At least two quarts of water a day should be drunk, and more is better. Many persons make the mistake of drinking little or no water, except what they take in their coffee or tea. By and by, some dangerous disease afflicts them. Then they are surprised to be told by the wise doctor that if they had drunk plenty of water daily, their kidneys would have been kept well flushed, and the disease would very likely not have started.

Drinking freely of water is good not only for the kidneys but also for the digestive organs. We have learned in a former chapter that little or no water should be drunk with meals. But a glass or two of cool or hot water a half hour or more before meals, especially before breakfast, cleanses the digestive organs and helps to prevent constipation. Many have also found this simple practice the best possible cure for indigestion.

**Pure Water.** — We should, however, take pains to have our drinking water pure. Water in wells may



drain outhouses, barnyards, or cemeteries, and so become impure. The water of a river or lake may be made impure by sewage. Boiling water twenty minutes kills typhoid and other disease bacteria. This does

not mean only twenty minutes on the stove, but twenty minutes after boiling commences.

When in doubt as to the purity



A good way to kill germs in drinking water — boil twenty minutes.

of the drinking supply, boil the water twenty minutes.

Harmful bacteria have been known to be in ice taken from a lake or river containing sewage. On this account it is always safer to cool drinking water by putting it on the ice than by putting ice into the water.

**Good Water Remedies.** — Water is an excellent remedy in many common ailments. In cases of headache, caused by indigestion, drinking freely of warm water will usually compel any offending substance to pass from the stomach or to be vomited. Hot water or hot lemonade drunk just before going to bed will often relieve a cold by starting the perspiration. Placing a hot-water bottle against or near any part of the body that is in pain will often be a relief. Soaking the

feet in hot water just before going to bed is good for colds, headache, or sleeplessness. An enema (ĕn'ĕ-mă) of tepid, warm, or cool water forced by a fountain syringe (sîr'ĭnj) into the rectum, the lower end of the bowels, often wards off serious sickness by causing a thorough discharge of waste.

### POINTS FOR SPECIAL STUDY

1. About two-thirds of the human body is composed of water.

2. The body's outside covering, the skin, has thousands of perspiratory glands. They excrete perspiration, which, besides water, contains poisonous waste matter.

3. Waste, scales of skin, and oil collect on the skin, and obstruct or interfere with the work of the pores.

4. A daily cold or tepid bath and a warm bath at least once a week, are necessary to keep the skin clean and its pores active and healthy.

5. The two kidneys are situated in the back part of the abdomen, just below the diaphragm. They excrete urine, which is composed of water, some mineral matter, and a poisonous waste called urea.

6. Urine is stored in the bladder. The bladder should be relieved of its urine regularly several times a day. When urine is retained too long in the bladder, nervous strain may result and poisonous urea is not taken up from the blood as it should be.

7. Drinking freely of water flushes the kidneys and helps to keep them active and healthy.

8. Several glasses of cool or hot water a half hour or more before meals, especially before breakfast, cleanses and

stimulates the digestive organs, and also helps to prevent constipation of the bowels.

9. Water from wells near outhouses, cemeteries, or barnyards, or from rivers or lakes containing sewage, is likely to be impure. Such water should be boiled twenty minutes before it is used for drinking.

10. Ice from streams containing sewage should not be put into drinking water.

### QUESTIONS

1. Tell what part of your own weight is composed of water.
2. In what forms does water leave the body?
3. How is this loss made up?
4. What causes thirst?
5. Why are we more likely to be thirsty at times of hard play and work than when we are not active?
6. Describe the two layers of the skin.
7. Name the two sets of glands that the skin contains.
8. Tell all that is said about the skin.
9. Describe the perspiratory glands and tell how numerous they are.
10. Tell what is said of perspiration.
11. What is insensible perspiration?
12. Tell all that is said about the perspiratory glands and perspiration.
13. Explain why bathing is necessary.
14. At least how often should one bathe?
15. Tell the benefits of the daily morning sponge or plunge cold bath.
16. What is said of warm baths?
17. Tell the benefits of steam or hot-air baths.
18. Describe the kidneys.

19. What important service do the kidneys perform?
20. In what is urine stored?
21. Why should the bladder be relieved regularly several times a day?
22. What harm may be caused by retaining urine too long in the bladder?
23. At least how much water should be drunk daily?
24. In what way do people sometimes find out that they have been drinking too little water?
25. Tell how the digestive organs may be helped by drinking freely of water, especially before breakfast.
26. Mention several ways in which hot water is a simple but excellent remedy.
27. Tell how to make water from an impure source safe for drinking.
28. Tell why it is better to cool drinking water by placing it on ice than by placing ice in the water.

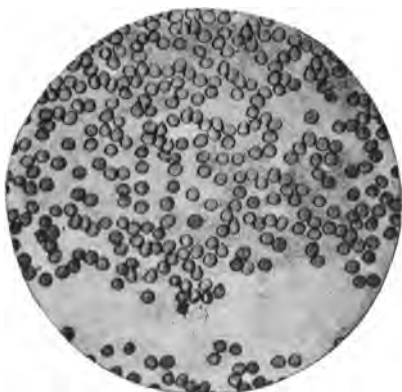
## CHAPTER XIX

### THE STORY OF OUR WONDERFUL RIVER OF LIFE

#### THE BLOOD AND THE CIRCULATION

We have read that blood carries digested food and oxygen to all parts of the body. What is blood? Through what does it travel in its rounds through the body, and what force drives it? Blood is composed of a liquid called *plasma* and tiny boat-like substances known as *red corpuscles* (kôr'pūs-s'lz) and *white corpuscles*.

The *plasma* is a colorless liquid, about nine-tenths of which is water. It supplies the tissues with nourishment, and also helps to convey carbon dioxide and waste to the lungs.



Human blood corpuscles. Magnified about 200 times.

The *red corpuscles* form about half the weight of the blood, and are about five hundred times more

numerous than the white corpuscles. Many thousands of red corpuscles are said to be in one drop of blood. They carry oxygen from the lungs to the tissues of the body, and bring back carbon dioxide to the lungs.

**White corpuscles** destroy disease bacteria that get into the body. They also perform other useful services.

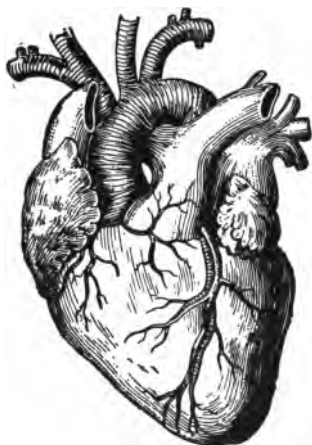
**Arteries** are the tubes or cord-like canals through which blood passes from the heart. Their walls are very elastic. After death the arteries are always found empty. For this reason, before the discovery of the circulation of the blood, it was thought that they carried air.

**Veins** are the tubes or cord-like canals through which blood travels to the heart. Their walls are thinner than those of the arteries and not as elastic.

**Capillaries** are the tiny blood vessels connecting the arteries and veins. They are so small and so numerous that you cannot prick the flesh of the body without drawing blood. Capillaries allow plasma, oxygen, and white corpuscles to pass among the tissues. They also let carbon dioxide and other waste pass from the tissues into the blood.

**The heart** is the organ that forces blood through the arteries, capillaries, and veins back to the heart again. It is situated between the lungs, and is shaped like a pear, having its pointed end downward and toward

the left side of the body. Its thick muscular walls are divided into four chambers. The two upper chambers are called the *right auricle* and the *left auricle*, and the

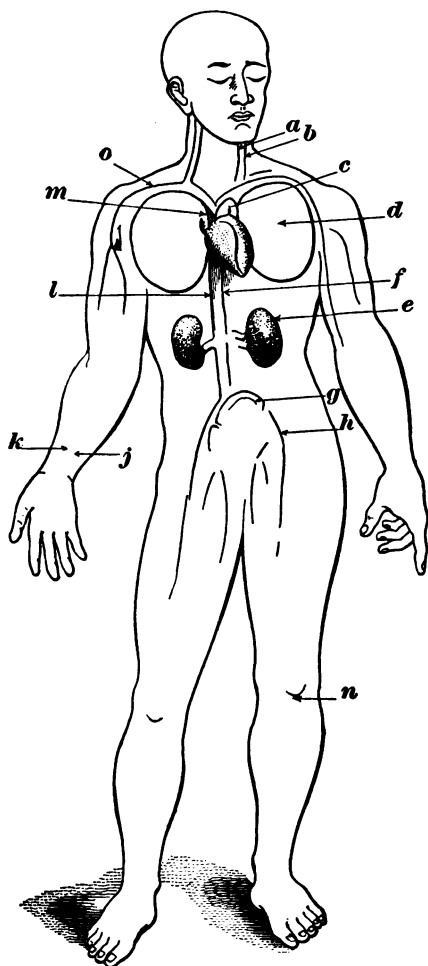


The heart.

two lower, the *right ventricle* and the *left ventricle*. The heart is an involuntary (in-völ'ün-tă-rŷ) muscle, — that is, it works without our willing it to do so. A tough membrane, called the *pericardium* (pěr'ĩ-kăr'dĩ-ŭm), surrounds the heart, protecting it from injury. Each auricle opens into the ventricle beneath it, but there is no opening between the

two auricles or the two ventricles.

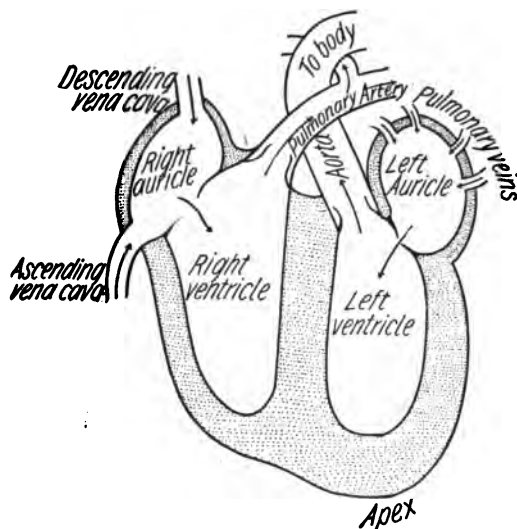
**The Course of the Blood.** — A contraction of the right auricle forces blood into the right ventricle. The latter then contracts, forcing the blood through the pulmonary artery into the numerous capillaries of the lungs, thence through the pulmonary vein to the left auricle of the heart. By contraction of the left auricle, blood that has come from the lungs is forced into the left ventricle whose contraction drives it into the large artery called the *aorta*, the largest artery of the body. This divides and subdivides until every part of



The large blood vessels of the body: *a*, left common carotid artery; *b*, left jugular vein; *c*, arch of aorta; *d*, blood vessels of the left lung; *e*, left kidney with renal vein and artery; *f*, abdominal aorta; *g*, left common iliac artery; *h*, femoral artery; *j*, ulnar artery; *k*, radial artery; *l*, ascending vena cava; *m*, descending vena cava; *n*, blood vessels of the knee; *o*, right subclavian vein.



the body is reached. The blood flows through



Showing the course of blood through the heart (Zuppke).

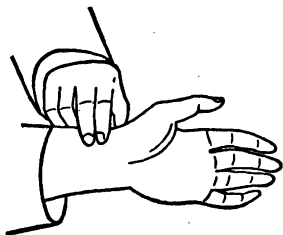
between the ventricles and the arteries leading from them, keep the blood from flowing backward.

**Color of Blood.** — The blood which comes through the veins to the right side of the heart, and passes through the pulmonary artery to the lungs, is dark red in color. The exchange of carbon dioxide and waste for oxygen, which takes place in the capillaries of the lungs, changes the color of blood to a bright red, which it retains while it is in the arteries.

**Pulse.** — The contraction or beating of the heart is sometimes called a *pulsation*. The arteries are so

elastic that they contract and relax as the blood flows through them, thus plainly indicating the heart beats.

By placing a finger on an artery, the rate of the heart beat can be easily counted. The inside of the wrist, just below the base of the thumb, is the place where the heart beat can be most readily found. The heart of an adult male usually



Showing how to find the pulse  
(Schemert).

beats about *seventy* times a minute, and that of an adult female about *eighty* times a minute. These are called the *normal rate*.

Illness often changes the pulse rate, since the poisons it causes affect the nerve that controls the heart. One of the first things the doctor usually does is to feel his patient's pulse. He wants to find out how frequent and strong the heart beat is. If the heart beat is strong, and near the normal rate, it is a sign that the illness is not very serious. If the pulse indicates that the beat of the heart is weak and much above or below the normal rate, it is a symptom of more or less serious sickness. It is a good thing to be able to judge the heart's action through the pulse. Every adult member of a family should be able to do this. Illness may often be warded off by a little care, if the heart beat shows that rest and quiet are necessary.

**The Heart's Work.** — As a rule, the heart beats more than four hundred times an hour and about one hundred thousand times a day. The only rest it has is a very short pause between beats. The various organs and tissues must be kept supplied with oxygen and nutriment. They must also be constantly relieved of carbon dioxide and waste. For these reasons, the heart must keep working on and on with only its slight rest between beats. Life ends when the heart stops beating. An adult's body contains about six quarts of blood. This is driven through the body so frequently, however, that the heart can be said to lift several hogs-heads daily.

**Alcohol.** — Alcoholic drinks so affect the white corpuscles of the blood that they are not effective in the work of resisting disease. Such drinks enlarge the arteries and cause too much blood to come to the surface of the body. In time they will cause the arteries to become so hardened that they may easily burst and cause death. Alcohol will also in time change the muscles of the heart into fat, causing weakness and death.

**Tobacco.** — The use of tobacco sometimes causes a noticeable change in the action of the heart. The condition is known as a "tobacco heart." If the use of tobacco is continued, serious results may follow. If the tobacco habit is given up, the heart's action will in time become normal again.

## POINTS FOR SPECIAL STUDY

1. Blood is the delivery wagon which carries oxygen and nutriment to all parts of the body, and brings back carbon dioxide and other waste.
2. We should not hinder the circulation of the blood by wearing tight garters, belts, or too closely fitting clothing of any kind.
3. Exercise, especially out of doors in the open air, aids in keeping the circulation healthy.
4. Fast running, rapid bicycle riding, or any other severe exercise too long continued, is likely to injure the heart and shorten life.

## QUESTIONS

1. What is plasma?
2. Tell about the red corpuscles.
3. What is said of the white corpuscles?
4. Tell all you can about blood and what composes it.
5. Describe the arteries and tell their use.
6. What is said of veins?
7. What are capillaries?
8. Tell how numerous capillaries are.
9. Tell all that is said about capillaries.
10. Tell the position and shape of the heart.
11. How many divisions or chambers has the heart, and what are their names?
12. What is said of the openings between the chambers of the heart?
13. What covering protects the heart?
14. Why is the heart called an involuntary muscle?
15. Tell all you can about the heart.
16. Tell the course of the blood from the right auricle of the heart to the left auricle.

17. Tell the course of the blood from the left auricle to the right auricle.

18. What keeps the blood from flowing backward?

19. What and where is the aorta?

20. Where does the change in the color of the blood take place, and what causes it?

21. What causes pulse?

22. Where is the best place to find the pulse?

23. What is the normal pulse rate of a man? of a woman?

24. What does the doctor judge from the pulse, and why?

25. Tell all you can about the pulse.

26. About how many times does the heart beat in an hour? in a day?

27. What rest does the heart have?

28. Why must it keep so constantly at work?

29. About how much blood is in the body of an adult?

30. How much blood may the heart be said to lift or force daily?

31. What is the effect of alcohol on the blood? on the arteries? on the heart?

32. What is the effect of tobacco on the heart?

## CHAPTER XX

### THE STORY OF OUR TELEGRAPH SYSTEM

#### THE BRAIN AND NERVES

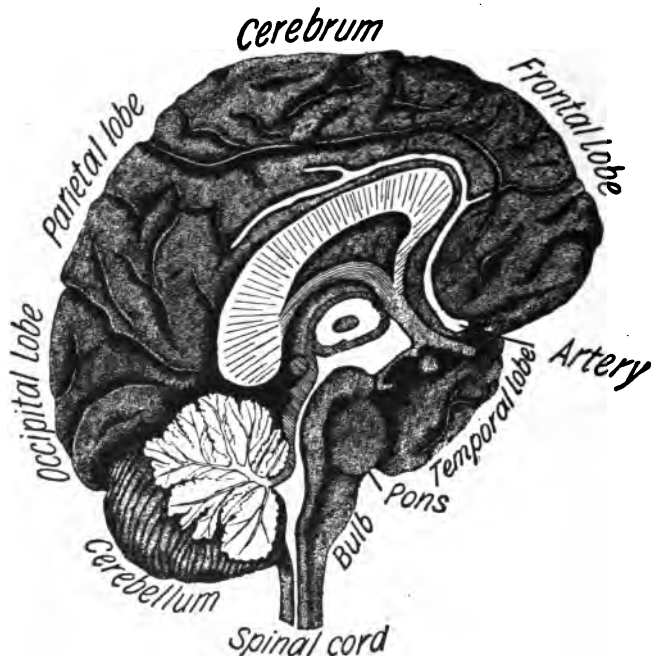
**The Nervous System.** — We have read that the heart and the digestive organs work without our willing them to do so. We also know that some muscles move as our will directs. Where is the will? How are its commands carried to all parts of the body?

The will or mind is in the brain. The brain telegraphs or sends its commands to all parts of the body over string-like fibers called *nerves*. The brain also receives messages from all parts of the body through nerves. The brain, spinal cord, and nerves, or the *nervous system*, form what may well be called the telegraph system of the body.

**The Brain.** — On page 126 we see a picture of the brain as it would appear if the skull that protects it were removed. It is composed of a soft substance, part of which is gray in color and part white. The surface of the brain is not smooth, but is wrinkled or has ridges called *convolutions* (kōn-vō-lū'shūnz). The small oval-looking part is called the *medulla* (mē-dūl'lā), or bulb. The part back of and above the

medulla is the *cerebellum* (sě'r'ě-běl'lŭm). The large or fore part is the *cerebrum* (sě'r'ě-brŭm).

The **medulla**, or bulb, connects both the cerebrum and the cerebellum with the spinal cord. Nerves that



The left half of the brain, inner surface (*Hebert*).

rise in the medulla control the greater part of the head and many of the internal organs of the body, including the heart and lungs.

The **cerebellum** is about the size of a small fist. Its use is not well understood. Animals whose cerebellum

has been injured can move the muscles. They cannot, however, use at the same time and in the right way all the muscles necessary for such an act as walking. As a result, they are uncertain in their movements and stagger like drunken men. From this it is thought that the cerebellum causes the muscles to keep a proper amount of contraction (kōn-trāk'shūn), and that it also assists in having them move together in the same order.

**The cerebrum** comprises more than three-fourths of the brain. A groove divides its upper surface into equal parts called *hemispheres* (hēm'ī-sfērz). It is the seat of all thought and action. It also receives all the messages that come through the senses of touch, taste, smell, hearing, and seeing. Without a cerebrum, we could not think or will; neither would any of our senses be of use to us.

Since the cerebrum is the seat of the nerves controlling motion, a hard blow on the top of the head causes one to fall down. The skull is not completely grown together until a child is two years old. For this reason special pains should be taken to protect babies from blows on the head through falls or any other cause. Such accidents have killed infants or crippled them in mind or body for life.

The cerebrum of an animal may be removed, and though its sense and power of action will be lost, yet



it will continue to live. If the cerebellum of an animal is injured, the proper control of its muscles is lost; but

if the medulla is injured, death follows at once, for breathing stops.

**The spinal cord** extends from the medulla to the base of the spine. It is our main telegraph line, and branches extend from it to all parts of the body. It is well protected by the backbone or spinal column. Notice the backbone and spinal cord of some animal from which the flesh has been removed, and you will get a fair idea of how your own are constructed.



The backbone or spinal column — side view.

**Care of the Nervous System.** — Since all the muscles and organs of the body are controlled by the brain through the nerves, it is most important that the nervous system should be kept strong and healthy. To keep in such condition, it must be supplied with plenty of pure air, nourishing food, and rest.

Simple, well-cooked food affords the best nourishment for the ner-



**The general arrangement of the nervous system (viewed from behind), showing the brain, the spinal cord, and the chief nerves that branch from it.**

K

vous system, for good digestion and good nerves, as a rule, go together. Notice children who are nervous and sickly. Often you will find that they eat a great deal of sweets, and are not regular about meals or other habits which affect the digestive organs.

Thought, action, and direction begin in the brain. All outside impressions (ĩm-prěsh'ũnz) come through the nerves to the brain. It follows, then, that the brain and the nerves are never fully at rest except in sleep. On this account it is most essential (ěs-sěň'-shăl) that every one should have regular sleep, and plenty of it.

**Sleep.** — Little babies should sleep the greater part of the day. Growing children need from fifteen to ten or nine hours daily. Adults should sleep from eight to ten hours. If one goes to bed at an early hour in the evening, it is safe to sleep until he wakes naturally (năt'ũr-ăl-lŷ) the next morning. Even if it be more than the number of hours that a person of his age is said to require, nature is simply giving needed rest to his nervous system.

Sometimes, after long-continued bicycle riding, running, or other very fast or hard work, one cannot sleep well because of the unusual beating of the heart. That is a good sign that such efforts are too severe for the nervous system, and that health may be injured by repeating them. Sleeplessness is an unfavorable sign

at any time for anybody, and one that should never be lightly considered. If continued more than a night or two, a competent (kõm'pě-těnt) physician should be at once consulted, and his advice carefully followed. Indeed, no care should be spared to get back the habit of natural, restful sleep.

It is time wasted to try to study whēn one is sleepy. Obey nature's command to sleep, and then study early in the morning. It is even more unwise to think it possible to get along with very little sleep just because one is so fortunate as to be strong. The ability with which both mind and body work depends upon the state of the brain and nerves. If they are well nourished and rested, we can do our best; if they are poorly nourished and tired, our best is not possible.

**Growth in Brain Power.**—The seat of thought, memory, and reason is in the brain. So also is our power of motion. Like all parts of the body, the brain grows strong through exercise. Some children think that they can never learn spelling, geography, history, or other studies requiring memory. Others think that they cannot master studies like arithmetic, that require reasoning. Time and again, it has been proved that, as a rule, if one keeps trying and trying, these faculties (fāk'ül-tíz) of the brain will be made strong. Likewise, a person may be very awkward and unskillful at certain games or exercises. Persevering, frequent

practice will also bring the desired gain here, if one has the will to keep trying. In both cases, success depends upon how hard one tries, and whether he keeps on trying long enough.

**Injuries to the Brain.** — Boys sometimes climb to places where dangerous falls are possible. Often, too, they are very careless about throwing stones and other hard things. A hard blow on the head or spine has often caused the loss of the power to think or to move, and has even resulted in instant death. No boy would risk dangerous falls if he stopped to think he might thereby be made a cripple or an idiot for life. Surely no one would throw hard things in play, if he knew the act might ruin a comrade's success and happiness.

**Alcohol.** — We know that drunken persons stagger because alcoholic liquor has caused the brain to lose control of the muscles. In a previous chapter, we also read that a large part of crime and insanity is due to the weakening effect of alcohol upon the will and mind.

**Tobacco and Cigarettes.** — Almost every one is made ill by tobacco the first time he uses it. That is due to its poisonous effect upon the nervous system. Boys who use tobacco have both their minds and bodies stunted. They get behind in school work, and become pale and weak in appearance. Often their wills are so affected that they readily drift into disgrace and crime.

Cigarettes are boys' deadly enemy. They should be labeled "Poison for Boys."

While preparing for athletic contests, college boys are not allowed to use either alcoholic drinks or tobacco. The reason is that they can work their best longer without them. Any one who wishes always to have the best control of his mind and muscles will never use either.

Luther Burbank, the greatest expert plant grower, said in the *Sunday School Times*: "I never use tobacco or alcohol in any form and rarely coffee or tea. Such stimulants cannot be used even mildly in work requiring strict attention and definite concentration (kǒn'sĕn-trā'shŭn) of the mind.

"To assist me in the work of budding, work that is as accurate (ăk'kŭ-răt) and exacting as watch-making, I have a force of twenty men. Some time ago my foreman surprised me by saying that, as a rule, the men I had to discharge because they could not do this delicate work, turned out to be drinkers or smokers. These men are able to do the rough work of farming, but call budding and other delicate work "puttering" (pŭt'tĕr-ĭng), and have to give it up because they cannot control their nerve force. Even men who smoke but one cigar a day cannot be trusted with some of my most delicate work. Cigarettes are even more damaging than cigars, and their use by boys is a little short of criminal. It will produce in them the same results that



**Mr. Burbank pollinating the blossoms of a plum tree. He thinks that using tobacco unfits men to do their best work.**

sand placed in a watch will produce — destruction (dě-strūk'shŭn).

“Several of my young acquaintances (āk-kwānt'-ān-cěz), who gave promise of making happy and useful citizens, are in the grave; and there is no question whatever but that cigarettes were the cause. No boy living would commence the use of cigarettes, if he knew what a useless, soulless, worthless thing they would make of him.”

Cigarettes produce a poison that ordinary tobacco or cigars do not have. The combination (kōm'bī-nā'-shŭn) of burning paper and tobacco produces a compound called acrolein (ā-krō'lē-īn). There is not much of this compound, but in what there is, lies the great danger of the cigarette.

Thomas A. Edison, the great inventor and chemist, says: “Acrolein is one of the most terrible drugs in its effects upon the human body. The burning of ordinary cigarette paper always produces acrolein. That is what makes the smoke so irritating (īr'ī-tāt-īng). I really believe that it often makes boys insane. We sometimes develop acrolein in the experiments with glycerine in my laboratory (lăb'ō-rā-tō-rŷ). One whiff of it from the oven drove one of my assistants out of the building, the other day. I can hardly make too great the dangerous nature of acrolein; yet that is what a man or boy is dealing with every time he smokes a cigarette.”



**POINTS FOR SPECIAL STUDY**

1. The brain, spinal cord, and nerves make up the *nervous system*.

2. The seat of all thought and action is in the brain. The commands of the brain are sent to all parts of the body through the nerves. All impressions received through the five senses reach the brain by way of the nerves.

3. A hard blow on the head may cripple one's mind or body for life. A blow on the backbone may also cause serious injury. Children's brains are not fully protected by the skull until they are about two years old. For this reason, special pains should be taken to keep their heads from injury.

4. Pure air, nourishing food, and plentiful sleep are all essential to a healthy nervous system.

5. Sleeplessness is a sign of disordered health that should always arouse much concern. No pains should be spared to get back the habit of natural, restful sleep as soon as possible.

6. Memory, reason, and quickness of thought and action, are all qualities that can be cultivated and strengthened by earnest, persevering practice; for the brain, like other parts of the body, is made strong by exercise.

**QUESTIONS**

1. Where is the will or mind?
2. Over what does the brain send its commands to other parts of the body, and through what does it receive messages?
3. What makes up the nervous system?
4. Tell of what kind of substance the brain is composed, and give the colors of this substance.
5. What is said of the surface of the brain?

6. Mention the three parts of the brain.
7. Tell all you can about the brain.
8. Describe: (a) the medulla; (b) the cerebellum; (c) the cerebrum, and tell the use of each.
9. If the cerebrum of an animal is removed, what is the effect?
10. What effect on an animal is caused by an injury to the cerebellum? to the medulla?
11. Tell what is said of the spinal cord.
12. With what must the body be supplied if the nervous system is kept strong and healthy?
13. What kind of food furnishes the best nourishment for the nerves?
14. What is often noticed about the habits of children who are nervous and sickly?
15. How much should little babies sleep? growing children? adults?
16. Why should continued sleeplessness cause much concern?
17. Tell why it is time wasted to try to study when one is sleepy.
18. Why is it unwise to think one can get along with but little sleep if he is strong?
19. Tell how memory, reason, and quickness, or gracefulness of action may be improved.
20. Why should hard blows on the head or spine be avoided?
21. Why is special care necessary to protect the head of a baby?
22. Tell the effect of alcohol on the brain.
23. Why does tobacco make ill one who uses it for the first time? Tell what is said of Burbank; of Edison.
24. Why should cigarettes be labeled "Poison for Boys"?

## CHAPTER XXI

### THE CARE OF THE BODY

#### THE TEETH

In a previous chapter we learned how important it is to masticate our food thoroughly. Good teeth are necessary for thorough mastication. Clean, regular teeth add much to any person's good appearance. Teeth are also an aid in speaking distinctly. For these and other reasons, we should always take the very best care of these useful tools.

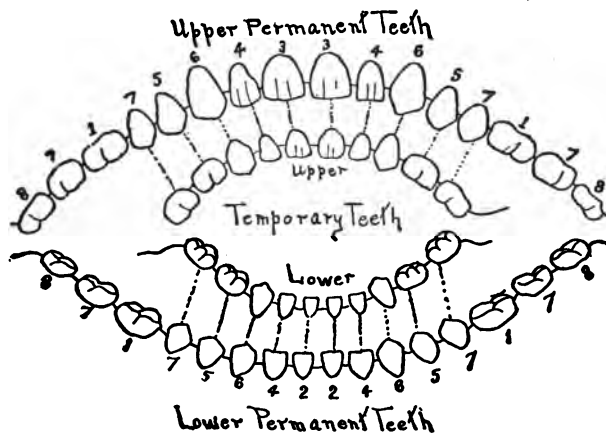
**Structure of a Tooth.** — The picture on this page shows the chief parts of a tooth. The part outside the gum is called the *crown*. The *roots* are the part within the gum. Both the crown and the roots are hollow.



Showing the structure of a tooth  
(Zinns).

Within the hollow space is the *pulp*, which contains the blood vessels and nerve. The outside of the crown is *enamel*, which is very hard. Underneath the enamel is *dentine*, which is much softer than enamel, and forms the chief part of the crown.

**Temporary and Permanent Teeth.** — Two different sets of teeth develop in our mouths. The milk teeth, or temporary set, come first. They are twenty in number, — ten in each jaw. These are followed by a second or permanent set. In this set there are thirty-



Temporary and permanent teeth.

two teeth, sixteen in each jaw. The above picture shows both the temporary and permanent sets. Notice that the front teeth are sharp and made for tearing or cutting, while the back teeth are broader and made for grinding. It can also be seen that the teeth in the lower jaw are like those having the same number in the upper jaw.

**Decay of Teeth.** — The way to keep our teeth white and healthy is to prevent decay. But can children learn to do this? Indeed they can, for the cause is

easily understood, and may be, to a large degree, prevented. The hard enamel of teeth is composed of lime and other minerals. Food, decaying in the mouth, produces an acid which dissolves enamel. The way to prevent our teeth from decaying, is to keep them free from small particles of food.



The best tooth brush.

**Cleaning Teeth.** — Of course, the way to do this, is to clean the teeth thoroughly every day. Merely using a tooth brush will not answer, for small bits of food will remain between the teeth, even after the most careful brushing. The following is an excellent way to get the teeth well freed from food.

First rinse the mouth with warm water. Then crowd dental floss between all of the teeth in both jaws to force out food particles, and follow this with another rinsing. Afterward use a tooth brush, being careful to move it up and down instead of crosswise. Moving the brush crosswise is likely to lodge food between the teeth, instead of getting it out. Now rinse the mouth again, and the teeth should be well freed from food. Last of all, a good tooth powder should be used.

**Dental Floss.** — As a rule, the teeth cannot be well freed from food without using dental floss. The latter

is really of greater value than the tooth brush. If one cannot have both, keep supplied with the dental floss by all means. Rinsing with water, using dental floss, rinsing again, and afterward rubbing the teeth with a cotton cloth will get good results. It is well to clean the teeth after each meal; but often this is not convenient.



Spool of dental floss.

The best plan, then, is to rinse the teeth after each meal, and clean them thoroughly just before going to bed. If all food particles are removed just before retiring, there will be no chance for acid to form from decaying food during the long hours of sleep. On this account, upon going to bed is the very best time to clean the teeth.

**Object of cleaning Teeth.** — Do not think that the object of cleaning the teeth is to nicely polish the few that are in front. The chief aim is to remove all food particles from the mouth. No matter how well one may polish the front teeth, acid produced by decaying food between the back teeth, will cause decay there. This may spread from tooth to tooth until the front ones also become infected. Besides, the principal use of teeth is to aid in preparing food for digestion. In this most important work, the back teeth are just as useful as those in front.

Some people think it is not necessary to clean the first

or temporary set of teeth, since they last but a few years. Such an idea is also mistaken. Many poor sets of permanent teeth and much ill health have very likely been caused by failure to take good care of the first set. Notice the picture on page 139. It can be seen that the last three teeth on either side of both jaws in the permanent set are not in the temporary set. These broad teeth are called *molars*.

**The First Permanent Molars.** — The four molars marked *1* are among the first permanent teeth to arrive. They are spoken of as *sixth year molars* because they frequently appear in the mouth when one is about six years old. Often these are full grown before many of the temporary set are removed. If the first set are allowed to decay, these molars of the second set may also become diseased, and later infect others of the permanent teeth. In the course of a few years, the roots of the first teeth are absorbed by the blood, and the growing permanent teeth force their crowns loose from the gum. Nevertheless, while in the mouth, all temporary teeth should be kept clean and healthy.

**Regular Visits to the Dentist.** — Decay causes cavities (*kāv'ī-tīz*) in teeth, and in spite of the most careful cleaning these will often get started. For this reason, one should have his teeth examined and cleaned by a dentist regularly twice a year, from the age of four at the latest. A small cavity weakens a tooth very little

and can usually be filled without pain. The larger a cavity becomes, the more it weakens the tooth, and the nearer it gets to the nerve, — hence the more pain the work of filling is likely to cause. With his tools, the dentist can remove tartar, a harmful substance, that often gathers on teeth and cannot be removed by brushing. It is claimed that cavities may be entirely prevented by a visit to the dentist once a month.

**Food and the Teeth.** — To keep healthy, teeth must also receive the right kind of nutriment from the blood. Milk, eggs, breakfast foods, bread, and vegetables contain lime and other good teeth-building materials. Much candy and other sweets should not be eaten.

**Need for Exercise.** — We know that the blood carries nutriment to all parts of the body. Like other parts, the teeth must be exercised in order to have a good circulation of blood. One who lives upon liquids and such soft foods as pie and cake, will have poor teeth, because so little chewing is necessary in eating them. Crust, toast, and any food that requires vigorous chewing help to keep teeth healthy by giving them vigorous exercise. Other things being equal, a food that compels vigorous exercise of the teeth should be chosen instead of one that does not, both for the sake of mastication and the health of the teeth.

**How Teeth are Injured.** — Do not pick the teeth with pins or anything else made of metal. Do not use them



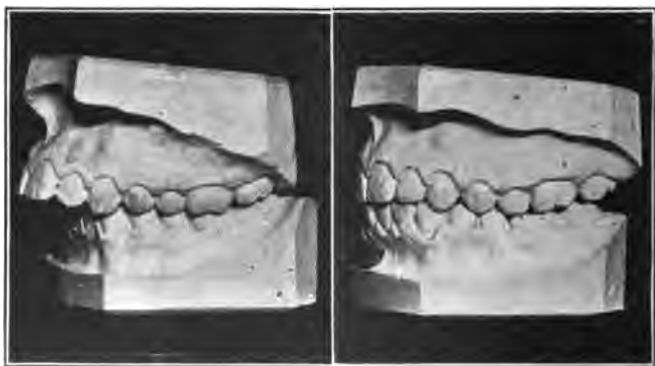
to crack nuts or other things harder than food. Do not bite thread or string. Do not immediately (im-



“Hand-I-Hold Babe Mit.”  
Device to prevent thumb sucking.

mē'dī-āt-lŷ) follow hot drinks or food with cold, or cold with hot. Do not take medicines containing iron or acid except through a tube. Any of these practices may injure

the hard enamel, thus opening a path for decay. Do not smoke or chew tobacco, for it discolors teeth and makes them less beautiful.



Showing the teeth before and after straightening.  
(Loaned by Dr. Herbert A. Pullen.)

**Making Teeth Regular.** — Regular teeth are more beautiful than those that are crowded out of position.

Often the permanent teeth are crowded because the jaws do not grow large enough. This lack of growth is caused partly by not chewing the food enough, and by eating too much soft foods that do not give the teeth the exercise they need. Sometimes permanent teeth are not regular, because the temporary ones were removed too soon. While teething, children are often allowed to constantly suck a thumb or a "pacifier." This should not be allowed, since it sometimes causes an ill-shaped mouth and irregular teeth. Devices that will prevent children from sucking their thumbs can be bought at slight expense. Continuous mouth breathing and constant sucking in of the lower lip also cause the same defects, and should not be allowed.



Portrait of girl before and after teeth were straightened.  
(Loaned by Dr. Herbert A. Pullen.)

The science of making irregular teeth more regular is called orthodontia (ôr-thō-dôn'shâ). A specialist in

orthodontia can greatly improve the looks of an irregular set of teeth. Though the work requires many short visits and takes some time, it is not painful. Such a change often adds so much to the beauty of the mouth and teeth that one feels well repaid for the expense and trouble.

### POINTS FOR SPECIAL STUDY

1. There are twenty teeth in the temporary set and thirty-two in the permanent set. The latter contain twelve molars not found in the former.

2. Enamel is the protecting armor of teeth. Decay of teeth is caused by the acid from decaying food in the mouth dissolving some of the enamel. One may largely prevent decay of teeth by keeping the mouth free from food particles.

3. The chief aim in cleaning teeth should be to remove all substances that may cause decay in the mouth. Dental floss is very useful in teeth cleaning, since with it, food that has lodged between the teeth may be crowded out.

4. One should have his teeth examined and cleaned by a dentist, regularly twice a year, at least from the time he is four years old, and before, if necessary. Any cavities may be filled at these times. The temporary teeth should be cleaned and filled as carefully as the permanent set.

5. Irregular teeth result from constantly sucking the thumb, sucking in the lower lip, continuous mouth breathing, and other causes. The appearance of an irregular set of teeth can be greatly improved by a specialist.

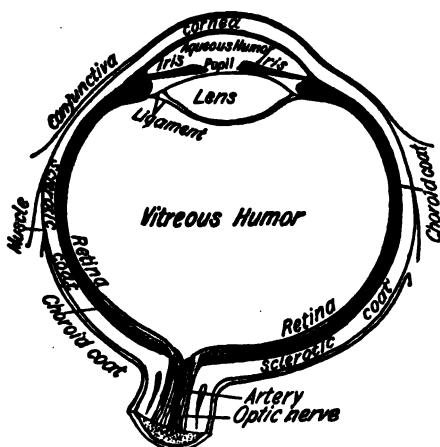
## QUESTIONS

1. Tell three ways in which the teeth are useful.
2. What part of a tooth is the crown?
3. Where are the roots of a tooth?
4. What is enamel? dentine?
5. Where are the blood vessels and the nerve of a tooth?
6. How many teeth in the temporary set? in the permanent set?
7. What causes teeth to decay?
8. Tell three important things necessary to do in cleaning your teeth.
9. Explain why dental floss is of great value in teeth cleaning.
10. When is the very best time of day to clean the teeth, and why?
11. Why is it unwise merely to polish the front teeth?
12. Tell why the temporary teeth should be kept clean and healthy.
13. What are the "sixth year molars," and why do they often become diseased?
14. Why should one have his teeth examined by a dentist at least twice a year?
15. What kind of food must be furnished teeth to keep them healthy?
16. Of what foods will those wishing to have good teeth eat but little?
17. Why do teeth need vigorous exercise, and what foods furnish it?
18. Mention several practices likely to injure the enamel of teeth.
19. Tell some of the causes of irregular teeth.
20. How may the appearance of an irregular set of teeth be improved?

## CHAPTER XXII

### THE EYES

**Usefulness of the Eyes.** — Few realize how much we have to depend upon our eyes. In dressing, eating, working, playing, — in fact, in nearly everything, they guide our movements and let in correct ideas of the outside world to the brain. How much they add to



A section through the eyeball.

our pleasure and usefulness, only those who have become blind can tell. How greatly good sight increases our ability in study and work, and our skill and activity in play, those with weak eyes well know.

Much of our success and happiness in life will depend upon keeping good sight. This is a most important fact that cannot be realized too soon. Another is that no reader of this book is too young to form the habit

of doing several things that will help to favor and to protect his eyes. None should be so unwise as to keep from doing some things that will surely weaken their power of seeing.

**The Eye and the Camera.** — Perhaps we may own a camera. If not, we very likely have seen some one

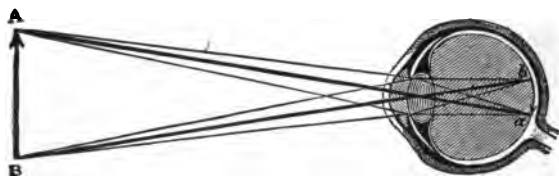


Learning to use the camera.

else use one. We know that in taking a picture a spring is touched that, for a second or more, lets rays of light travel through a glass lens to a sensitive plate or film behind it. If the one taking the picture is in such a position that the rays of light come to a focus (fō'kūs) upon the sensitive plate or film, a clear picture can be developed; if not, the picture will be blurred and not distinct.

In some respects, our eyes are like a camera. The little round hole in the center of the eye, called the *pupil*, becomes larger or smaller according to the brightness of the light in which what we are looking at happens to be. The rays of light from this pass through the eyeball, which corresponds to the glass lens of the camera, and are focused upon the *retina* (rět'ĩ-nà), the innermost coat of the eyeball. Pictures made by these rays upon the retina are at once carried through the *optic nerve* to the brain.

**Use of the Muscles of the Eye.** — In learning to use a camera, films are often blurred because the rays of light did not come to a focus upon the sensitive plate or film. In order to have a clear picture through our eyes,



Showing how the eyeball brings the rays of light from an object to a focus on the retina.

the rays of light from the object at which we are looking must be focused upon the retina. In properly formed eyes, some wonderful little muscles so change the form of the eyeball that it brings the rays of light to the right focus.

Rays of light from a distance come to a focus upon the retina of properly formed eyes with little or no effort of the muscles. The nearer and the smaller the object we are looking at, the harder work the muscles of the eye have in so changing the form of the eyeball as to bring the incoming rays to a focus. It also requires effort of these muscles to make both eyes focus a near object at the same time.

**Resting the Eyes.** — From these facts we can learn two important truths. First, that such close work as reading and sewing costs the muscles of the eyes severe effort. Second, that looking at distant objects causes the muscles of the eyes little or no effort. When our eyes feel uncomfortable, we can often make them all right again by doing no reading and other close work for a few hours or days. While doing close work, we may easily rest our eyes by once in a while gazing off at distant objects, if only for a few seconds.

In doing close work, we should always have plenty of light. In most rooms, it is far better to sit near the windows when we are reading. Artificial (är'tī-fish'äl) light is always more trying to the eyes than daylight. When doing close work, do not sit facing the light. The light should fall on the work from above and behind; when one is writing it should come over the left shoulder, if he is right handed. Often simply giving up study and other close work at evening for a time



will restore the eyes to good condition. Sleep during the hours of darkness is one of the very best remedies



Correct position for reading.

for eye weakness. If the eyes feel strained, study can be done with much better results by early morning light.

### **Favoring the Eyes.**

— We should not do close work with the eyes by twilight or any other changing light. It is too trying for the eyes, since the changing light makes

harder work for the muscles, and the light often becomes entirely insufficient (in'sŭf-fish'ĕnt) before we realize it. Reading while traveling in a car, or any other moving vehicle, is also very trying. The jarring caused by the motion of the car keeps constantly changing the position of the paper, and so the muscles of the eyes must keep working to change the focus.

Anything we are reading should not lie flat upon the desk or in our laps. Try reading a page or more with the book flat, and then hold it up in a slanting or vertical position. The gain in vision will be so great that

you will surely see the wisdom of always favoring your eyes in this way.

Sit in an erect position while reading, for stooping makes harder work for the muscles and also interferes with the circulation of the blood. Besides, trying to see in a dim light and leaning the head forward while reading, are likely to cause a change in the shape of the eyeball and produce nearsightedness (*nēr-sīt'ēd-nēs*).

Do not read while lying down, for this practice is very trying to the eyes. Long or severe illness of any kind weakens the muscles of the eyes as well as those of the rest of the body. Therefore one should read little or none while recovering from severe illness. The eyes of delicate children are usually weak. On this account they should study or read but very little. Staying out of school a few months or even years to get strong is far better, in the end, than to go to school with weakened body and eyes, for fear of getting behind other children of the same age. Little children should use their eyes very little for close work.

The page we are reading should not be held any nearer than is necessary to make the print distinct and clear. Print that cannot be readily made out at a distance of eighteen inches, is too small to be read continuously. Do not read books having white glazed paper, on account of the glare. Books should be selected that have plenty of space between both words and lines. This

prevents the words or lines from seeming to run together as one reads.

When the eyes feel uncomfortable, they should not be rubbed with the hands, since harmful bacteria may get into them in this way. Bathe the eyes in cool water, and dry them with a clean cloth. Do not wipe your face on a public towel. Some one who previously used the towel, may have had eye disease, and you may get the bacteria from the towel. A person having a discharge of any kind from the eye, should not leave his towel where others may chance to use it.

**Cinders in the Eye.** — The eye is so sensitive that cinders or tiny particles of any solid will cause great discomfort if they get inside. The eyelids and their lashes usually protect from these by closing, even without our willing them to do so, whenever anything injurious comes toward them. Sometimes, however, cinders and other substances get by these useful guards. If we wait a moment, water from the tear glands will often wash such particles down to the lower lid, from which they may be readily removed. Pulling the upper lid down over the lower, and holding it there, will often help the tears in this process.

If the particle is too firmly fixed to be removed in this way, an older person or a physician should be secured to take it out very soon, since severe injury, as well as discomfort, may follow, if it is allowed to re-

main unduly long. Any liquid containing acid, lime, or other alkali, or wood alcohol may severely injure the eye. If, by any mischance, such liquids get into the eye, a physician should be visited at once.

**Infants' Eyes.** — Special pains should be taken to protect the eyes of baby brothers and sisters. They should not be exposed to bright light of any kind. When taken out for a ride, their eyes should be most carefully shaded from the sun. If, soon after birth, there happens to be a discharge from the little one's eyes, a physician or nurse should attend until the trouble is cured. Many cases of both weak sight and blindness have been caused by lack of attention to a discharge from one or both eyes when the person was a little baby.

**Nearsightedness.** — It is great good fortune to be born with perfectly formed eyes. Many are not. In some persons, the eyeball is so deep that the rays of light come to a focus before reaching the retina. This is called nearsightedness, since persons with such eyes can see near objects better than at a distance. Leaning the head forward while reading, and reading too much by dim light, sometimes bring on nearsightedness by changing the form of the eyeball. This is a most excellent reason for avoiding both of these habits.

**Farsightedness and Astigmatism.** — The eyeballs of some persons are so shallow that the rays of light reach

the retina before being focused. This defect is called farsightedness (fär'sīt-ěd-něs) because such eyes can see distant objects better than those near by. Sometimes the eyeball is so curved that it cannot see horizontal and vertical lines equally well. Since letters are made up of both horizontal and vertical lines, this defect, which is called astigmatism (ă-stīg'mă-tīzm), makes reading and study more difficult.

**Squint or Cross-eye.** — When one or both eyes remain all of the time turned in toward the nose, the condition is called cross-eye. This is caused by farsight or some other defect too severely taxing some muscles of the eye. In the beginning, cross-eye may sometimes be cured by glasses. If the trouble is too far advanced for glasses to remedy it, the oculist (ŏk'ū-list) can do so by a slight operation. The difficulty may return afterward, if glasses are not worn to correct the improper form of the eye. It is very important to have cross-eye corrected, for, in that condition, it is difficult to use both eyes at the same time. For this reason, the eye affected may in time lose its power of accurate vision.

Nearsightedness, farsightedness, and astigmatism can all be largely overcome by having an oculist prescribe glasses that will correct the form of the eyeball. The eyes of every healthy child ought easily to distinguish the leaves of the trees, the colors of the sky,

and the faces of friends at a distance on the street. They ought also to readily make out writing on the blackboard in the schoolroom, and to read good print from a book without discomfort.

**Glasses.** — If one is healthy and strong, and his eyes fail to do this, he should not be satisfied until they have been examined by a competent oculist. If glasses are prescribed, he should wear them just as directed by the doctor. They will be some bother, of course; but what is that compared with the great gain in school work and skill in play that is sure to follow? Both the oculist and the spectacles may cost several dollars. If, however, a person with poor vision could, but for a moment, fully realize the gain in ability and happiness that glasses might bring, he would gladly work his best for months to earn them.

### POINTS FOR SPECIAL STUDY

1. Strong and accurate eyesight is one of the best aids to happiness and success in life.

2. Rest from reading, sewing, and other close work for a few days will often make tired eyes strong again. Even rest from close work by artificial light for a week or two will sometimes have the same result.

3. *Seven Ways to Favor the Eyes:* —

(a) Always have plenty of light for reading and other close work.

(b) Have the light come from behind and over the left shoulder.

- (c) Look for a few seconds at distant objects now and then while reading or studying.
  - (d) Always sit erect and hold the head up while doing close work.
  - (e) Read only books that have good print with plenty of space between the words and lines.
  - (f) Hold anything from which you are reading, up toward a level with the eye.
  - (g) Bathe the eyes in cool water after rising each morning.
4. *Ten Things not to do with the Eyes: —*
- (a) Never do close work facing the light.
  - (b) Do not look steadily at the sun or any other bright light.
  - (c) Do not do close work by twilight or other changing light.
  - (d) Do not let a book or paper you are reading lie flat upon a table or desk.
  - (e) Do not read while lying down.
  - (f) Do not use the eyes for close work when the rest of the body is weakened by illness.
  - (g) Do not hold a book or paper too near the eyes.
  - (h) Do not rub the eyes.
  - (i) Do not wipe your face on a public towel.
  - (j) Do not allow anything that causes discomfort to remain in the eye.

### QUESTIONS

1. What part of the eye corresponds to the little round hole which lets light into a camera?
2. To what part of a camera does the eyeball correspond?
3. What part of the eye corresponds to the sensitive plate or film of the camera?

4. What nerve connects the eye with the brain?
5. Why are the plates or films of a camera often blurred by one who is just learning to use it?
6. What makes the eyeball properly focus rays of light upon the retina?
7. Which come to a focus more readily in properly formed eyes, rays of light from near-by objects or rays of light from distant objects?
8. Why is it restful to the eyes now and then to look away at distant objects while reading or studying?
9. Explain why rest from all close work for a few hours or days will often make tired eyes all right again.
10. Why does rest from all close work by artificial light often have a good effect?
11. Tell why in most rooms it is well to sit near windows when doing close work.
12. Why should close work not be done by twilight?
13. Why is it very trying to the eyes to read while riding on a moving vehicle?
14. Which is the easier for the eyes, to read from something lying flat on the desk, or from something that is held up toward a level with the eye?
15. Why should one sit in an erect position and hold the head up while reading?
16. Why is it well not to read while lying down?
17. Tell why one should not read while getting well from severe illness.
18. What is said about the eyes of delicate children?
19. What print is too small to read?
20. Why is print that has not plenty of space between words and lines very trying upon the eyes?
21. Why should we not rub our eyes?
22. Tell why it is not well to wipe your face on a public towel.



23. Describe a good way to get a cinder or other particle out of the eye.

24. Name three liquids that are especially injurious to the eyes.

25. What special pains should be taken with the eyes of infants?

26. What defect in the form of the eyeball causes near-sightedness, and how is this defect sometimes caused? Far-sightedness?

27. Tell what is said of the cause and effect of astigmatism.

28. Tell the cause, effect, and cure of cross-eye.

29. How may the defects of nearsightedness, farsightedness, and astigmatism often be overcome?

30. Mention several things a properly formed eye should be able to see well.

31. What may be gained by wearing glasses?

32. Mention *seven* ways in which you may favor your eyes.

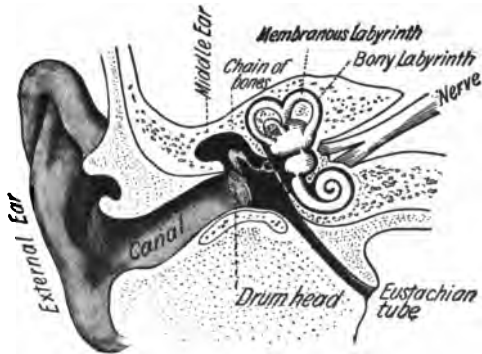
33. Tell *ten* things not to do that may injure your eyes.

## CHAPTER XXIII

### THE CARE OF THE BODY

#### THE EARS

**Value of Good Hearing.** — People sometimes dispute as to whether good eyesight or good hearing is of the greater benefit. The one thing certain is that either is altogether too valuable to get along without, if it can possibly be kept. The pleasure of hearing the conversation of our friends, the joy of listening to music and the many delightful voices of nature, are all lost through deafness. It is, to say the least, a great handicap not to plainly hear our teachers and fellow-pupils in school. It is also true that impaired hearing unfits one for many desirable vocations (vō-kā'shūnz).



Section through the ear.

Surely, then, it is well worth while to learn how to protect and care for our ears. To understand the reasons for such care and protection, we need first to learn some facts about the structure and working of these important organs.

**Structure of the Ear.** — The ear has three divisions, the outer, the middle, and the inner ear. The outer ear is the little flap of cartilage and skin called the *auricle*, which we can see and feel, and the small tube leading inward from it. The latter is called the *auditory* (a'dī-tō-rŷ) *canal*.

The **middle ear** or **ear drum** is a very small cavity at the end of the auditory canal. It contains three tiny bones joined together to form a little bridge or chain. It is separated from the auditory canal by a thin membrane called the *drumhead*, often incorrectly spoken of as the *ear drum*. In front of the middle ear cavity, there is an opening into a little passage, called the Eustachian (ū-stā'kī-ăn) tube, which leads into the throat. This little passage serves the very useful purpose of keeping the pressure of air in the middle ear the same as that of the outside air.

The **inner ear** is a shell-shaped hollow in one of the bones of the skull. It contains a fluid, and has a lining from which float delicate nerves which connect with the brain.

**How we Hear.** — Throw a stone into the water and watch the ripples pass from the place where it strikes. Sound travels in waves through the air as motion passes from the place where a stone falls into the water. These traveling sound waves are taken up by the auricle of the ear, and directed into the auditory canal to the middle ear, where they set the drumhead in motion. The motion of the drumhead is imparted to the chain of bones in the middle ear. This in turn sets the liquid of the inner ear in motion, and the nerves fastened to the floating soft parts therein, carry the sound to the brain.

**Conditions Necessary to Good Hearing.** — To have good hearing, the auditory canal must be open and unobstructed; the drumhead must be in good condition to vibrate; the chain of bones must be free to move forward and backward as the drumhead vibrates; the liquid of the inner ear must respond freely to the motion of the chain of bones, and the nerves must be in good condition to carry the impressions (īm-prěsh'-ŭnz) to the brain.

**Stoppage of the Auditory Canal.** — The auditory canal contains glands which secrete earwax. Earwax serves the useful purpose of stopping dust and small insects. The skin of the auditory canal grows outward, and so, as a rule, careful daily bathing of the ear will remove the wax not needed. Sometimes earwax is

packed down by trying to swab or dig it out, and so sound cannot pass through the auditory canal. In such cases the wax should be syringed (sīr'īnjd) out by a physician or some one who knows how to do it without injuring the ear. After the impacted (īm-päkt'ēd) wax is removed, the hearing will be good again.

Buttons, other small articles, and even live insects sometimes get into the ear. There is no need for the alarm that such accidents often arouse, for the drumhead will keep anything from getting into the middle or inner ear, where harm can be done. However, one should not try to get them out with a wire or anything pointed, since that might injure the drumhead. The auricle should be drawn upward and downward, and the head held so that the ear will open downward. Then, if the head is shaken gently, what is inside the canal may drop out. If not, it may run out with some warm water that has been carefully syringed in. Should both methods fail, a physician should be visited without delay, as injury might, in time, be caused.

**Injury to the Drumhead.** — If the drumhead is broken or injured, it will not vibrate as it should, and hence deafness results. Such injuries may be caused by some pointed article such as a pencil or wire being thrust into the ear by accident. On account of both eyes and

ears, children should be very careful about playing with anything pointed.

A loud explosion near the ear or a hard, quick slap on the ear may cause severe injury to the drumhead. Great care should be taken not to get too near giant firecrackers or cannon that are about to explode.



**Deafness and other serious injuries are caused by carelessness in using fireworks.**

The fun and excitement of hearing the loud noise lasts but a moment. The deafness it may cause, will last for a lifetime.

**Stoppage of the Eustachian Tube.** — One of the most common causes of injury to the drumhead is stoppage

of the Eustachian tube. Since this tube leads from the throat to the ears, it is affected by colds just as are other parts of the air passages. Continuous mouth breathing, frequent colds, and other causes often so inflame the Eustachian tube as to stop up its entrance. The pressure of the air of the inner tube is then less than that of outside air. On that account the pressure of air from outside breaks the drumhead, causing deafness. If we breathe pure air, keep free from colds, and avoid the mouth-breathing habit, we shall keep the Eustachian tube open and healthy.

Snuffing any liquid violently (vī'ō-lěnt-lŷ) through the nose, or jumping from high places, while in swimming, without holding the nose, may, in time, cause stoppage of the Eustachian tube, and so should be avoided. One should also be very careful to get water out of the ears after going in swimming, for not doing so may cause injury.

Deafness, roaring, and other unusual sounds in the ear are signs that the Eustachian tube may be stopped. A vigorous blowing of the nose will often open the tube and give relief. If either deafness or these unusual sounds continue after a cold, measles, scarlet fever, or any other disease, an aurist (ā'rĭst) should be at once consulted.

**Earache.** — This is a serious sign that should not be allowed to continue long without consulting an aurist.

It may sometimes be cured by placing a hot-water bag or hot cloths back of and below the auricle. Simply breathing into the ear will sometimes soothe a slight attack. Warm oil or other liquid should not be poured into the ear to relieve pain, unless so advised by a physician.

**A Discharge of Pus from the Ear.**—This is also a serious symptom that should not be neglected. Nor is deafness the only danger to be feared from such a cause. If the pus happens to come from within the drum, the trouble may spread to the inner ear and brain, and death itself result.

**Other Causes of Deafness.**—It should also be remembered that persons have been made deaf by taking frequent large doses of quinine (kwī'nīn). On this account one should be very careful in the use of this drug. Deafness is also caused by working where one almost constantly hears the loud clatter of machinery. Any one engaged in such work should wear ear protectors to keep out the sound.

**Testing the Ears.**—Persons are often deaf a long time in one ear without knowing it, for they manage to hear well enough with the other ear to get along. As disease may readily spread from one ear to another, it is important to be sure that both are healthy. One can do this by now and then testing the ears. The low-spoken voice should be heard at a distance of



twenty feet. A watch with a loud tick can be heard about three feet from the ear, and one with a low tick about one foot away. If these sounds cannot be distinctly heard by one ear, when the other is covered, it is a sign that an aurist should be consulted.

**Discomforts of Deafness.** — If persons with good hearing could but realize what discomfort and real loss attend deafness, they would always take the greatest pains to protect and care for their ears. Many really bright children are thought dull in school, because poor hearing makes them unable to understand. If, by some good fortune, the difficulty is removed, such children often get on as well as the best.

Often deaf people have roaring and other sounds in the ear nearly all the time. This is not only disagreeable, but is likely to cause nervousness. Very deaf persons cannot hear themselves speak, and so their voices are either very loud or very low. It is difficult for them to enjoy society, because they can neither hear nor be sure that they are making others understand. For these and other reasons, the deaf are often shy and unhappy. Tell a deaf person how much bother it is to properly care for and protect your ears. He will answer, "There is nothing so hard that I would not try my best to do it, if it would only bring back the hearing that I used to have."

## POINTS FOR SPECIAL STUDY

*Six Things to do in caring for the Ears:—*

1. Bathe the ears carefully each day to remove waste skin, dirt, and earwax.
2. Breathe through the nose, and keep free from colds.
3. Always get the water out of your ears after going in swimming.
4. If you have roaring or other unusual sounds in the ear, consult an aurist.
5. If you have either continuous earache or discharge of pus from the ear, consult an aurist without delay.
6. Wear ear protectors, if you work where there is a continual loud clatter of machinery.

*Ten Things to avoid doing in caring for the Ears:—*

1. Never put pencils or other pointed articles in your ears.
2. Do not try to swab or dig out earwax.
3. If an insect or any small article gets in your ear, do not be unduly frightened, and do not try to remove it with a wire or anything pointed.
4. Do not get near giant firecrackers or cannon that are about to explode.
5. Never strike any one on the ears.
6. Do not snuff any liquid violently up the nose.
7. While in swimming, do not jump from high places without holding the nose.
8. Never pour warm oil or any liquid into your ears, unless so advised by a doctor.
9. Do not take either frequent or large doses of quinine.
10. Do not work amid the loud clatter of machinery without wearing ear protectors.

### QUESTIONS

1. Name the three divisions of the ear.
2. What is the outer ear?
3. What is the middle ear sometimes called?
4. Tell what separates the auditory canal from the middle ear.
5. What does the middle ear contain?
6. What tube leads from the middle ear to the throat, and what useful purpose does it serve?
7. Tell all you can about the middle ear.
8. Describe the inner ear.
9. Tell how we hear.
10. Mention several conditions necessary to good hearing.
11. What glands are in the auditory canal, and what is the use of the wax they secrete?
12. Why should this wax not be swabbed or dug out?
13. What does impacted earwax sometimes cause?
14. How may impacted earwax be removed?
15. Why is there no need for great alarm from insects or small articles getting into the ear?
16. How should they be removed?
17. Tell why pencils and other pointed articles may injure the ear.
18. What injury to the ear may be caused by a loud explosion?
19. Tell how stoppage of the Eustachian tube may injure the ears.
20. Mention some causes of the stoppage of the Eustachian tube.
21. Give some signs of the stoppage of the Eustachian tube.
22. In what simple way may the stoppage of the Eustachian tube sometimes be relieved?

23. Tell what is said of earache.

24. Why is the discharge of pus from the ear a serious symptom?

25. Why should one be very careful in the use of quinine?

26. Tell in what kind of work it is well to wear ear protectors.

27. Explain why it is well to be sure that we are hearing through both ears.

28. Tell how to test the ears.

29. Why are some really bright children dull in school?

30. Mention some of the discomforts of deafness.

## CHAPTER XXIV

### THE CARE OF THE BODY

#### THE VOICE

**The Voice — Value of Voice Training.** — Some people are paid good salaries for singing in choirs. Famous singers receive what seem to be fabulous sums for one concert. Often public speakers get large prices for a lecture, largely because of their excellent use of good voices. No one will question that care and pains in training the voice have well repaid such persons.

Even singing well enough to please our friends and to enjoy taking part in singing, ourselves, is a great benefit, since few things count more toward taking one into good society and giving him healthful enjoyment than taking part in and liking good music. Ability to use the voice well is a great help in expressing one's thoughts in public; and this power adds much to the usefulness of any citizen. Simply for these reasons, then, careful training of the voice is well worth while.

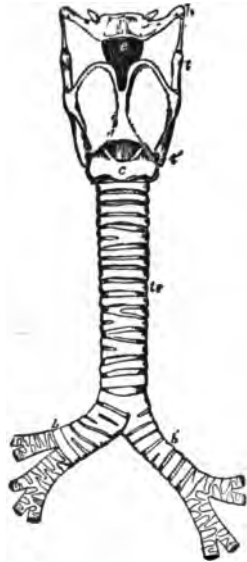
But leaving singing and public speaking out of the question, using the voice correctly is of great value to everybody. There are few things that may make one

more winning or do more to help him to favor than a pleasing, well-modulated (mǒd'û-lât-ěd) voice in conversation. The effect of a handsome face may be almost spoiled by a harsh or shrill voice. So, too, a gentle, refined voice may make a person with a plain face very attractive.

Without question good English and a pleasing voice are among the most marked evidences (ěv'ĩ-děns-ěz) of good education and refined home and school associations (ăs-sō-sĩ-ā'shũnz). If the voice were given one-twentieth of the attention in school that English receives, there would be great improvement, since care and thought in childhood would, in most cases, prevent harsh or shrill tones.

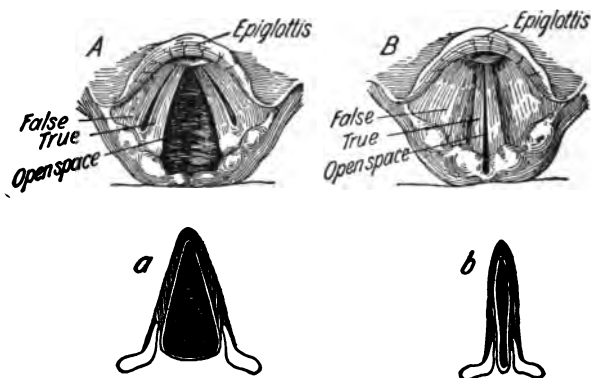
#### The Vocal Cords and Sound. —

The larynx, the "Adam's apple" that we can feel at the top of our windpipe in the throat, contains the vocal cords. They are two little flat bands of membrane running along each side within the larynx, and from back to front. Except when we use the voice, they lie close to the sides of the larynx, and are not affected by the



The larynx and windpipe, ventral view. *b, b'*, bronchi; *c*, cricoid cartilage; *e*, epiglottis; *h*, hyoid bone; *t, t'*, thyroid cartilage; *tr*, windpipe.

air passing from the lungs. When we are using the voice, certain muscles cause these cords to tighten so that they move toward each other until there is but a narrow space between them. The air passing from the lungs over the stretched cords causes them to vibrate (vī'brāt), thus producing sound. A slight current of air makes a little sound. A heavy current of air produces a loud sound.



The larynx, top view (*Zuppke*). *A* and *a*, the vocal cords in resting position; *B* and *b*, the vocal cords in position for producing voice.

**Pitch of Tone.** — The *thick* strings of a violin and similar instruments (in'strū-mēnts) give low tones, and the thin strings, high tones. In strings of the same thickness a tight string gives a higher tone than a loose string, and a short string gives a higher tone than a long one.

The same is true of the human voice. Those who have long or thick vocal cords have low and heavy

voices. Persons with short or thin vocal cords have higher and less heavy voices. The larynx of men is usually larger than that of women. Hence their vocal cords are longer, and their voices have a lower pitch. A boy's voice changes because his larynx suddenly becomes much larger, and his vocal cords are lengthened. Colds sometimes cause the vocal cords to thicken, and so the tones become hoarse.

**Care of the Voice.** — While a boy's voice is changing, he should sing very little. It is well for all not to sing much when the vocal cords are affected by a cold. Always avoid straining the voice by singing too high, too loudly, or too long. With regular practice one may, in time, reach the desired note or volume without straining. Many good voices have been spoiled by carelessness in these respects.

A pleasing voice in conversation may be formed mainly by taking pains not to speak too loudly or too high. If one begins when quite young, it will soon become his habit, and there will be little need to think about it later. If there happens to be a deaf person in the family, special pains will be required not to use the same tone with others that it is necessary to employ with the one who is deaf. It often happens in such families that nearly every member speaks in unpleasantly loud tones. This may, however, easily be avoided if one will but think.



**Breath Control and Voice.** — The best singers and public speakers use deep breathing. Thus they have plenty of air in their lungs, and having developed strong breathing muscles, they readily control it in speaking and singing. From this we see that developing our lungs and breathing muscles gives us better control of our voices. So, also, exercising and training the voice is excellent exercise for the lungs.

**Speaking Plainly.** — Many persons do not speak plainly because they fail to open their mouths wide enough for the sound to pass out freely. They also neglect to make such use of the tongue, teeth, and lips as will sound the final syllables and letters. In speaking, the mouth should be opened so that at least two fingers, one above the other, can be placed between the teeth. Through practice in saying words and sentences that end in final *g*'s, *s*'s, *t*'s, *d*'s, and other letters and syllables that are difficult, much power may be gained in speaking distinctly.

**Quality of Tone.** — The quality of tone depends not only upon the length and thickness of the vocal cords, but also upon the shape of the roof of the mouth. Many persons speak with a more or less thin nasal tone. We say that they speak through their noses. As a matter of fact, this is often caused by the nose being stopped up by adenoids or something similar. Sometimes it is merely a bad habit that can be corrected by being careful.

## POINTS FOR SPECIAL STUDY

1. Pleasing voice and distinctness of speech are marked signs of education and refinement. By taking pains to avoid loudness and shrillness of tones in conversation most persons can have such a voice.

2. Distinctness of speech may be gained by opening the mouth when using the voice, and by gaining facility in the use of the tongue, teeth, and lips, through practicing words and sentences containing final *s*'s, *t*'s, *d*'s, and other difficult sounds.

## QUESTIONS

1. Tell why being able to sing well is often a great benefit.

2. State how a pleasing voice in conversation is of great benefit to anybody.

3. Tell what is said about the vocal cords.

4. What causes the vocal cords to make sound?

5. Tell about the pitch of tone in violin strings.

6. Why are men's voices heavier than women's?

7. What causes a boy's voice to change?

8. Mention some ways in which voices are often injured.

9. Tell how a pleasing voice in conversation may be formed.

10. If there is a deaf person in the family, why is it necessary to take special pains about one's tone?

11. State some causes of indistinct speaking, and tell how one can improve in these respects.

12. Besides the vocal cords, on what does quality of tone depend?

13. What is said about speaking through the nose?

## CHAPTER XXV

### THE CARE OF THE BODY

#### CLOTHING, HAIR, AND NAILS.

**Clothing.** — Clothing helps to keep us warm because it prevents the heat of the body from escaping too rapidly. Air is a poor conductor of heat. Therefore loosely woven clothing, such as woolen, is warmer than garments made of cotton, linen, or some closer weave. For a similar reason, two thin garments or blankets are warmer than one of the same weight as both together. Dark colors attract heat. Hence light-colored clothes are cooler in summer than those of a darker color. It is important to wear heavy enough clothing to keep us comfortably (kŭm'fěrt-ā-blŷ) warm. At any season of the year, however, it is a mistake to "bundle up" with too heavy or too many clothes. They not only keep the body too warm, but also prevent the air from doing its part in cleansing the skin.

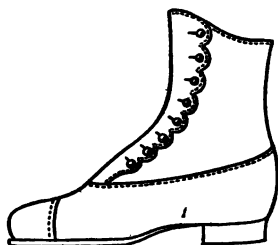
**Underclothing.** — Whatever is worn next to the skin becomes soiled, and so should be readily washed. For this reason as well as to help in keeping warm we should wear underclothing. Woolen underwear is good because

it does not allow bodily heat to pass too fast, and also because it readily absorbs perspiration. Porous or mesh cotton or linen underwear is warmer and better than closely woven garments of the same material.

**Shoes and Rubbers.**—Shoes of pliable leather are more comfortable than those of stiffer material. Neither very narrow nor extremely wide shoes should be worn; but one should buy shoes that are like the nat-



An unhygienic shoe.



A hygienic shoe.

ural shape of his feet. High, narrow heels are injurious, and should not be worn.

Rubbers should be removed when one goes indoors to remain any length of time. If left on, they make the feet too warm and often cause one to catch cold upon going out into the cold air.

**Good Taste in Dress.**—Neatness and good taste in dress are without doubt important helps to success in life. Like a pleasing voice and distinct speech, they aid both in giving a good first impression (ĩm-prěsh'ũn) and likewise in retaining respect. Our clothes should

always be clean and tidy. The colors we wear should always be in harmony (här'mǝ-nĩ). The materials used should be chosen on account of their beauty and simplicity (sĩm-plĩs'ĩt'ỹ), and not because they are of a striking or gaudy pattern. It should not be forgotten that both hat and shoes are conspicuous (kǝn-spĩk'ũ-ũs) parts of one's dress. They should be kept neat and clean by frequent and thorough brushing.

**Growth of the Hair.** — The skin or covering of the head is called the *scalp*. Each hair grows from a tiny root in the scalp. It is also supplied with oil by tiny oil glands. Like other parts of the body, the scalp is supplied with nutriment by the blood. It also needs to be cleansed by the air. Hence anything that interferes with the circulation of blood to the scalp or that keeps air from the scalp will affect the healthy growth of the hair. It is also true that if the pores of the scalp are allowed to become stopped up, it will become diseased.

**Care of the Hair.** — Hair may be washed daily, but soap should not be used on it more than once a week. When soap is used, it should be thoroughly washed out. Frequent vigorous brushing and rubbing of the scalp help the circulation of blood, and so tend to keep the scalp healthy; they also help to make the oil glands active. Hair oils or pastes should not be used, because

they tend to make the scalp dirty and to stop up the pores.

In a previous chapter we read that the skin is constantly shedding little scales. In the scalp these scales are called *dandruff* (dăn'drűf). Bathing and the friction (frík'shűn) of clothing readily remove these scales from the skin of the body. The hair of the scalp helps to retain them. Daily thorough combing and brushing the hair is necessary to remove dandruff. If dandruff is not removed, the scalp is very likely to become unhealthy.



Caring for the hair.

**Baldness.** — Baldness is thought to be largely caused by wearing too heavy and too tight hats, since they both interfere with the circulation of blood to the scalp, and keep air and sunshine away as well. Not removing dandruff is also a cause. By going without a hat as much as possible, by wearing hats and caps of light weight, and by frequent brushing and combing the hair, baldness may be prevented.

Boys whose relatives are bald are perhaps more likely to lose their hair than others. They should take special pains in the matter of keeping the scalp well cleansed and exercised, and in wearing light hats. Even after the hair has begun to fall out, vigorously rubbing the scalp with the ends of the fingers several times daily will restore it to a healthy state. This practice is also excellent before the hair begins to fall out.

The hair both protects the head and adds to its beauty. It is a fine thing to have a good head of hair as long as we live, since it adds to our appearance of youth and strength. It is not hard to understand how to keep the scalp healthy. If boys could look into the future and see themselves bald, or with good heads of hair, they would surely think a little daily care the best kind of an investment. It is simply another case of forming a daily habit that will count.

**The Nails.** — The nails are the hardened parts of the outer skin (epidermis) that protect the ends of the fingers and toes. They aid the fingers in picking things up, and likewise add to the beauty of the hands and feet.

**Care of the Nails.** — Toe nails should be cleaned and trimmed at least when one takes the weekly warm bath. If allowed to become too long, they grow into the flesh and cause discomfort and pain.

Finger nails should be kept short by trimming or

filing (fil'ing). When so cared for, it is easier to keep the dirt out, though even then they should be cleaned several times a day. It is well to form the habit of caring for the finger nails whenever we wash our hands. If at such times we also gently push back the skin from the nails, hangnails may be easily prevented. Clean, well-kept finger nails are signs of good breeding that all should possess. As in many other particulars, the early formation of the right habit is the chief thing.



Caring for the nails.

#### POINTS FOR SPECIAL STUDY

1. Tidiness and good taste in dress are excellent signs of proper self-respect and decent consideration (kōn-sīd'ēr-ā-shūn) for others.
2. We should form the habit of caring for the finger nails whenever we wash the hands. Hangnails may be prevented by pushing the skin back from the nails when the hands are bathed.
3. Hair may be kept healthy by keeping the scalp clean and by wearing nothing on the head that will interfere with



the free circulation of blood to the roots of the scalp, or the free access of air to its outer surface.

### QUESTIONS

1. Tell why loosely woven clothing is warmer than that which is tightly woven.

2. Why are two light garments warmer than one of the same weight as both?

3. Why is dark clothing warmer than that of the same weight of a lighter color?

4. Tell what is said of "bundling up."

5. What is said of underclothing?

6. Why are neatness and good taste in dress helps to success in life?

7. Tell what materials to choose for our clothes.

8. Give two uses of finger nails.

9. Tell what is said about the care of toe nails; of finger nails.

10. State how hair grows and by what it is supplied with oil.

11. What prevents the hair from being healthy?

12. Mention several things one should do to help keep the scalp healthy.

13. What is said of dandruff?

14. Mention the causes of baldness.

15. Tell how to prevent baldness.

16. Why should we try to have a good head of hair as long as we live?

## CHAPTER XXVI

### THE CARE OF THE BODY

#### COMMON ACCIDENTS

There are many common accidents that injure the body, and sometimes even cause death. By using care and good sense it is possible to avoid many of these. In spite of the best of care, however, it may be our misfortune to meet with some of them. It is well, therefore, to know a few simple remedies, which, if used in time, may be of service.

**Bruises.** — These are caused by falls or by the flesh being struck by something blunt. The part of the body struck usually swells; it also becomes black and blue on account of the bursting blood vessels. This discoloring may be prevented, to some extent, by applying cloths wet in hot or cold water every two or three minutes. This treatment also helps to reduce the swelling.

**Cuts.** — Any cut through the skin should be at once cleansed, and covered with a bandage or plaster. If it is not, harmful bacteria may get in and cause serious injury. A cut from a rusty nail, or anything else that is dirty, may produce fatal results. At the first sign

that anything severe or unusual is developing from such a cut, a physician should be visited. If a cut is so deep that there is a large flow of blood, the cleanest cloth at hand should be pressed upon the wound, and one should hurry to a doctor, or send for one.

**Burns and Scalds.** — Burns and scalds are commonly caused by fire, hot water, acids, or alkalies. If one's clothing catches fire, the worst possible thing to do is to run. The best thing is to smother the fire with a rug, cloak, or other thick garment. Linen cloths soaked in a mixture of soda and water are excellent for burns. Cloths soaked in oil or smeared with vaseline may be applied afterward. Touching a charged electric wire causes severe burns and sometimes death. It should always be avoided. In case of any severe burn a doctor should be consulted.

**Effects of Cold.** — Partly frozen noses, ears, fingers, and toes are more or less common in a cold climate. If proper care is not taken, much discomfort and bother may follow. The frozen part should be rubbed in snow or cold water until it begins to tingle and get red. Both the tingling and the change in color are signs that the circulation of blood, which was stopped, has been restored. One should not go near a stove or other warm place until the frost has been removed.

**Escaping Gas.** — Many persons have been killed by breathing escaping gas. Before going to bed, one

should always take pains to see that gas burning in either chandelier or stove in the sleeping room is fully turned off. People, not used to gas, sometimes make the mistake of blowing it out.

**Drowning.** — Both boys and girls should consider swimming a very important part of their education, since it is the best way to prevent drowning. It may be useful to know that it takes very little to prevent one from sinking, if he tries to keep only his nose above water. One should never hang heavily to the neck or body of a person who is trying to save him from drowning. By so doing, he may drown both himself and his rescuer (rěs'kû-ěr). By hanging on lightly and merely keeping the nose above water, the work of rescue is made far easier.

In case a boat tips over, those overboard should not try to climb on top of it, for by so doing it may be sunk. Instead, they should all take hold of the boat lightly, simply trying to keep their noses above water till help appears.

**Fainting.** — Several conditions produce fainting. As the cause is always too little blood in the head, the person who has fainted should be laid flat on his back. The clothing about the neck should also be loosened, so that the blood may flow to the head more freely. People should not crowd around a fainting person, since that keeps the air away, and he needs all that open



Teaching girls to swim.

doors or windows can give. Water sprinkled on the face and smelling salts and ammonia held to the nose are both helpful.

**Sting of Bees.** — The stings of bees usually pain at first and cause rapid swelling. As a rule, they can be relieved by bathing the part in a strong mixture of soda and water or in ammonia.

**Poisons.** — Poisoning is caused by taking certain drugs, eating foods in which poison has developed, and in various other ways. If one becomes poisoned, a doctor should be sent for at once. Until his arrival, relief may be sought through vomiting.

Drinking several glasses of warm water and salt, or a mixture of a half teaspoonful of mustard and a glass of water, and following it with several glasses of warm water, will usually cause free vomiting.

Some plants are poisonous. Neither the leaves, roots, nor fruit of any plants should be eaten, unless one knows them to be harmless. Toadstools are among the common poisonous plants. Since they resemble mushrooms, which are good to eat, they are sometimes gathered and eaten by mistake.

**Poison ivy** is a vine that grows in the woods and along fences. It bears its leaves in clusters of three, and each leaf has three distinct leaflets. When this plant comes in contact with the skin of some persons, it causes painful swelling. Others are harmed very

little by it. A mixture of one-fourth of an ounce of borax and two ounces each of glycerine and water frequently applied is an excellent remedy. Witch-hazel is also good.

#### POINTS FOR SPECIAL STUDY

1. Cloths wet in cold or hot water every two minutes and placed on a bruise will help prevent both discoloring and swelling.
2. Any cut through the skin should be at once cleansed and covered to prevent harmful bacteria from getting in.
3. Cloths dipped in a mixture of soda and water are excellent to put on a burn.
4. The best way to remove frost from any part of the body is to rub it with snow or cold water. One should not go near a stove or other warm place until the frost is removed and the flesh begins to tingle.

#### QUESTIONS

1. Mention some common causes of bruises.
2. Tell two effects of a bruise.
3. Describe a good way to treat a bruise.
4. Why should a cut through the skin be cleansed and covered?
5. What is said of cuts from a rusty nail?
6. What is it well to do in case of a deep cut?
7. State several ways in which burns are caused.
8. Tell what one should not do if his clothing happens to catch fire, and also what is best to do in such a case.
9. What is a simple but excellent remedy for a burn?
10. Why should one not touch a charged electric wire?
11. Why should we be very careful not to get acids or alkalies on the skin?

12. Tell how to treat a part of the body that is partly frozen.

13. What care should be taken by those who burn gas, and why?

14. Why should it be a part of every child's education to learn to swim?

15. Tell the easiest way to keep afloat in the water.

16. Tell what not to do when a person is trying to save you from drowning.

17. Why should persons who have been tipped out of a boat, not climb from the water on top of it?

18. Tell why a fainting person should be laid flat on the back.

19. What else may be done to relieve one who has fainted?

20. What is said of bee stings?

21. Tell two good ways of causing one to vomit freely.

22. Why should neither the leaves, roots, or fruit of plants be eaten unless we know that they are harmless?

23. Tell what is said of toadstools; of poison ivy.



## CHAPTER XXVII

### THE CARE OF THE BODY

#### CONTAGIOUS DISEASES

Any one who reads the death notices in the paper of a great city, will be surprised at the small number of people who live to old age. The great majority die in childhood or in middle life. Many deaths are due to diseases caused by the growth of minute plants or animals in the body; and these might often be prevented if people but had the knowledge, and knew how to profit by it.

**Disease germs** or **microbes** are minute animals called *protozoa* (prō'tō-zō'ā), or tiny plants called *bacteria*, that get into the body, and by multiplying rapidly, cause disease. They are too small to be seen without a microscope,—so small, in fact, that many thousands can be in a space no larger than a drop of water. They multiply by dividing into two parts about every half hour or more, and each part becoming a complete germ, and soon multiplying itself in the same way. Thus one germ can develop into several million in the course of a day, if conditions are favorable. Malaria is one of the diseases commonly caused by protozoa. Consumption, and all diseases of the lungs and throat,

typhoid fever, and many other diseases are caused by various kinds of bacteria.

**Important Facts about Disease Germs.** — As a rule, they cannot multiply rapidly enough to do harm in healthy, vigorous body tissue. Hence keeping strong and vigorous through the use of pure air, nourishing food, exercise, and rest is the best way to prevent their doing harm. They usually get started when one's vitality is reduced through too hard work, loss of sleep, or lack of pure air and good food. Outside of the body boiling water will kill them. So also will a solution (sō-lū'shŭn) of three teaspoonfuls of carbolic acid to a glass of water. Sunlight often destroys them. Some can live for a long time in water or in damp places. They also keep alive in dust and dirt.

**How Disease Germs Spread.** — In consumption, pneumonia (nŭ-mō'nĭ-ă), colds, diphtheria (dĭf-thē'-rĭ-ă), and all diseases of the air passages, the germs are in the sputum ejected by the patient. Particles of this may fly into the faces or upon the clothing of others when one coughs. It may also alight upon the floor or furniture, and be blown about in dust or air, thus being breathed in later by others. The patient should always have a handkerchief in front of his mouth when he coughs; he should also expectorate (ĕks-pĕk'tō-rāt) into a pasteboard cup that can be burned each day. All handkerchiefs, clothing, dishes, and anything else

used by the patient, should be kept by themselves and washed in boiling water. Rugs, carpets, heavy curtains, and other furnishings likely to retain germs, should be removed from the sick room.

In typhoid fever and some other diseases, the germs are in the waste matter that comes from the intestines of the patient. Hence these diseases are often spread by drinking water from wells or springs that drain outhouses, or from sewage-laden streams.

In scarlet fever, measles, smallpox, and other diseases the infecting germs seem to come from the skin of the patient. Sometimes they are got by touching or being touched by the sick person, or by touching something that he has handled or worn. Often they are carried in clothing from one home to another.

**Milk as a Germ Carrier.** — Consumption germs may be in the milk of cows that have the disease. Scarlet fever and similar germs may get into the milk from the hands or clothing of the milker or those who prepare it for market. Typhoid fever germs may get into milk in the water that dishonest dealers use to adulterate it.

**How to avoid Disease Germs.** — Protect yourself from the sputum of all persons ill with consumption, colds, and other diseases of the air passages. Do not drink out of the same cup used by others without carefully rinsing it. Do not put into your mouth anything that has been in the mouth of another. Be

careful not to allow your hand to rub against railings or other things handled by many people. Do not rub your eyes. Always wash your hands before eating. Boil drinking water, if there is any question as to its purity. Keep away from all places where there is any contagious disease.

In furnishing a house, hardwood floors or grained floors and rugs are more hygienic than floors covered with carpet. Carpets must be swept. Rugs can be taken out of doors to clean. In dusting, one should use moist cloths to prevent dust from flying. If water will



Dusting with a cloth moistened in liquid veneer or some similar preparation.

injure the furniture, dusting cloths should be moistened in liquid veneer or some similar liquid. Germs are likely to be in dust. Therefore the less dust stirred up in a room, the smaller the number of germs in the air its occupants breathe. Above all, through the use of pure air, nutritious food, pure water, exercise, and rest, keep your vitality so high that germs cannot multiply in your body.

**The House Fly.** — Children are often afraid of bees, and not without cause, for their sting is painful. Compared with bees, however, house flies do far greater harm to the body because they carry disease germs.

By use of the microscope, it has been found that as many as 6,500,000 bacteria may be on a single fly, and the average number is 1,250,000. Among these, there may be typhoid or cholera germs from the sewer or privy vault, tubercle bacilli from the cuspidor, or germs from a sore or other disease-infected spot. These may be deposited on food, on the nipple of the baby's bottle, on the lips of a sleeping person, or wherever the fly alights. By any of these routes, the germs may get within the body and cause disease.

The house fly breeds in manure and other filth. Therefore manure should be kept in a pit or vault that can be screened; privy vaults should also be screened; lime or oil should be frequently sprinkled on such pits or vaults. Garbage should be kept in covered receptacles (*rē-sĕp'tā-k'lz*) and burned or buried, if not carted away. Dead animals, straw, paper, or anything else that decays, should not be allowed to lie around the premises. The sewerage pipes should be kept in the best condition. Lime or kerosene should be frequently sprinkled in drains. If flies are seen in a home, one may be sure that the breeding place is

near-by filth. It may be in the cuspidor, behind the door, or in a neighboring barn.

Doors and windows that may be much opened should be kept screened in warm weather. If one cannot afford screens for all such openings, those of the kitchen and dining room are the most important. Any flies that get into a room should be killed. Great pains should be taken to keep flies from the sick. Food exposed for sale in places where flies can get to it, should not be bought. In every way, all should be awake to the fact that the fly is a positive enemy to life and health, and do their part in exterminating (ěks-těr'mī-nāt-īng) him.

**The Mosquito.** — This insect helps in spreading malaria, and so is an enemy to health. He breeds in moist or swampy places. For this reason, yards and neighborhoods should be kept free from pools, swamps, marshes, and other moist places. If oil is poured on such places, it prevents the breeding of mosquitoes.

**Children's Diseases.** — Scarlet fever, measles, mumps, whooping cough, and chicken pox are some of the diseases that are much more common to children than to adults. All of these diseases are taken by being with those who have them, by handling something that they have made use of, or by taking the germs from some one else who has done one or both of these things.

**Scarlet Fever.** — This disease often begins with a sore throat. Chills and headache may also be present. A fine scarlet rash appears first on the neck and chest, and then spreads uniformly over the rest of the body. The skin is hot and dry, and in severe cases the fever is very high.

**Measles.** — The beginning of measles resembles that of a severe cold. Often there is repeated sneezing and a discharge from the nose. The eyes may be red and watery. The rash appears on the face and neck. It comes in patches, the skin between appearing healthy, but afterward spreads over the entire body.

Many children die of both scarlet fever or measles, especially the former. Deafness, weakness of the eyes, and many other serious permanent troubles, often follow each. For these reasons, they should be carefully avoided.

**Diphtheria.** — In diphtheria, there are white patches on the inside of the throat. Often there is difficulty in swallowing. Like scarlet fever and measles, it needs the immediate attention of a physician. Recently an antitoxin (ăn'ti-tõx'ín) has been discovered, the prompt use of which causes this disease to be fatal much less often than it used to be.

**Chicken Pox.** — In chicken pox a rash usually appears, first on the body and then on the head. This may be preceded by slight fever and vomiting. In a

few days, the blisters of rash dry up; then they scab and peel off. As a rule, one is not very ill with this disease if he keeps from catching cold.

**Whooping Cough.** — This can always be told by severe coughing and the well-known whoop that always attends it. The disease sometimes lasts a long time and is very trying and disagreeable. For these reasons one should try to avoid taking it by not playing with children who have the disease. No effort should be spared to keep a baby from getting whooping cough.

**Mumps.** — In this disease the glands below the ear swell up, and are so sore that one cannot eat or swallow with comfort. Both sides of the throat may swell at the same time, but more often one side is followed in a few days by the other. One should stay quietly at home until the swelling disappears, and be careful not to catch cold.

Some people think that some or all of these children's diseases are bound to be had sometime, and that childhood is the best period. This is a great mistake. It is not only far better, but also perfectly possible, not to have any of them.

**Smallpox and Vaccination.** — Before the practice of vaccination (văk'sī-nă'shŭn) was begun by Dr. Jenner, of England, in 1798, smallpox was one of the most terrible of plagues. In England and Wales, on the average, 3000 persons of every 1,000,000 died of small-



pox. Less than one hundred years later the entire number of deaths from smallpox in these countries in one year was only fifteen.

In many places, health officers require children to be vaccinated when they enter school, and a second time some years later. Parents often oppose this, fearing injury to children. If a child is healthy, a sore arm for a few days is, as a rule, the only unpleasant result. Surely the remarkable results which history shows to have been accomplished through vaccination should justify this practice.

**Consumption** (tuberculosis [tū-bě'r'cū-lō'sis] of the lungs). — It is estimated that twelve people out of every hundred die of this disease. In one year in New York State almost twice as many people died of consumption as of scarlet fever, measles, smallpox, typhoid fever, diphtheria, croup, and whooping cough together. Indeed, one need not wonder that consumption is often called the "Great White Plague."

**The Cause of Consumption.** — Some people think that consumption is caused by a cold. The cause, however, is farther back than that. The food and air taken into the body has not produced enough vitality. Therefore bacteria that have got in have been able to increase rapidly. Their rapid increase has produced not only the cough but also the loss of flesh, weakness, fever, night sweats, and other symptoms that attend

the disease. One great difficulty in fighting consumption is that people think they have only a cold until the bacteria have too good a start to be easily stopped.

**The Prevention of Consumption.** — The very best way to prevent consumption is to keep one's vitality high through the use of abundant pure, cool air, plain, nourishing food, vigorous exercise, and sufficient rest. Then if germs do get into the body, they cannot multiply. Of course one should also avoid taking the germs, as far as possible.

Children of consumptive parents, narrow-chested people, and those whose work is indoors, have less power to resist consumption germs than have others. They should take special pains to sleep with wide-open windows, to eat only nourishing food, and to practice deep-breathing exercises at least twice a day. If these three things are faithfully and regularly done, almost any one can keep from being a victim of the "Great White Plague."

**The Cure of Consumption.** — No medicine will cure consumption. Being out of doors in daytime; sleeping out of doors, or indoors with the best possible ventilation, at night; eating freely of eggs, milk, olive oil, fruit, meat, and other nutritious but easily digested foods, are the effective cure. Alcoholic drinks do not aid but retard one's recovery. The same is, as a rule, true of patent medicines.

A change of climate to mountain or other regions where the air is dry is usually very helpful. One of the greatest benefits from going to such a place is that one



Raybrook Sanitarium, Adirondacks. On the porch in cold weather.

becomes impressed with the value of out-of-door air and nourishing food. He sees others, too sick to walk, maybe, sitting out of doors all day, and hears that they sleep with wide-open windows. He learns the value of an abundance of eggs, milk, and similar foods in his diet, and the great benefit of complete rest, if he chances to have fever.

The main things, however, are the out-of-door air, nourishing food, and rest. It is far better to have these with good care and contentment at home than to be poorly cared for and unhappy in the best of climates elsewhere.

Several states now have sanatoria (săn'ă-tō'rî-ă) for consumptives in regions of high altitude. Many cities have day camps where poor consumptives can get pure air and nourishing food, living out of doors in tents, often free of charge. Public and private societies are making great efforts to have everybody understand how to prevent and to cure consumption. This has already resulted in largely decreasing the disease, and will, it is hoped, in time stop its ravages.

#### POINTS FOR SPECIAL STUDY

1. Many diseases are caused by minute plants or animals multiplying rapidly in the body. These germs are not likely to multiply fast enough to do harm in healthy, vigorous tissue.

2. The best way to keep free from germ diseases is to keep the body strong and healthy through the use of pure air, plain food, pure water, exercise, and rest.

3. House flies are positive enemies to life and health. They carry disease germs from filth and deposit them where they may get into the human body. Flies breed in manure and other filth. Pains should be taken to prevent their breeding. Windows and doors should be screened to keep flies out of homes, and all that get in should be killed.

4. In consumption and other diseases of the air passages, the germs are in the sputum. This should be burned, and all possible effort should be made to keep the germs from a sick person from getting to any one else.

5. Sunlight helps to destroy disease germs. Therefore we should let the sunlight freely into our windows, and always prefer a sunny room to one that gets little or no sunlight.

6. It is both possible and desirable to avoid all of the so-called children's diseases. Any of them may leave permanent injury. Scarlet fever and measles are especially likely to do so.

7. Consumption is the greatest destroyer of human life. It is not caused by a cold, but through a loss of vitality allowing bacteria to multiply. It cannot be cured by medicine. Cool, out-of-door air, plain, nutritious food, and rest are the best cures for this disease.

### QUESTIONS

1. What are disease germs or microbes?
2. What is said of the size of disease germs?
3. How do they multiply?
4. Tell the best way to prevent these germs from multiplying in our bodies.
5. In what condition is the body, as a rule, when they get started?
6. Tell two ways these germs may be killed when outside of the body.
7. In what diseases are the germs in the sputum?
8. Tell what pains should be taken to avoid their getting from a sick person to some one else.
9. In what are the germs of typhoid fever and some other diseases?
10. How are such diseases often spread?
11. What is said about the way scarlet fever and other disease germs spread?
12. Tell how disease germs may spread through milk.
13. Tell several easy ways in which you may avoid disease germs.
14. How may a fly spread disease germs? Tell all you can about how to prevent flies from breeding.

15. Tell how a mosquito spreads malaria and other diseases.

16. Name five diseases that are more common to children than to adults.

17. What is said of scarlet fever? of measles?

18. Why should both scarlet fever and measles be carefully avoided?

19. Tell what is said of diphtheria; of chicken pox; of whooping cough; of mumps.

20. What is said of the correctness of the idea that every one must have these children's diseases sometime, and that childhood is the best period?

21. How much did smallpox decrease after the beginning of the practice of vaccination in 1798?

22. Why should parents not oppose the vaccination of healthy children?

23. How many people out of every hundred die of consumption?

24. What is said of the cause of consumption?

25. What is the very best way to prevent consumption?

26. Tell three classes of persons who are the most likely to have consumption; state three things they should do to keep themselves from becoming victims of the "Great White Plague."

27. What is said of air in the cure of consumption? of food? of alcoholic drinks? of patent medicines?

28. What change of climate is usually good for a consumptive? State one of the greatest benefits from going to such a climate.

29. What movements have been started that will greatly decrease the ravages of consumption?

## CHAPTER XXVIII

### THE CARE OF THE BODY

#### EXERCISE AND BODILY VIGOR

If a boy owns a pony, he likes to have it look as fine and be as graceful and swift as possible. To this end the pony is carefully fed, watered, cleaned, trained, and exercised. No trouble is too great, if the little animal will only be made handsomer and more useful. There are few children to whom a fine, active pony would not be a most welcome present. There are very few, too, who would not take the best care of one, if they were so fortunate as to receive such a gift.

Not many children can have ponies. But all have bodies of their own that are much more useful, and of far greater value. Shall they become healthy, strong, and graceful, or sickly, weak, and awkward? This will depend largely upon what each makes up his mind to have, and how well he cares for and trains himself to that end.

We have learned how we can best use food, air, and water in building our bodies. We have found out how to care for our eyes and ears, and how to guard our bodies from accidents and disease. We have also

learned why the brain and nervous system must have plenty of rest, and why the blood must keep carrying oxygen and nutriment to all parts of the body. By making use of this knowledge in daily habits, almost everybody can be healthy.

But we should not be satisfied to have our pony merely healthy. We should want him strong, active, and graceful; nor would simply proper feeding, watering, and cleaning make him so. He would gain and keep strength, activity (ǎk-tiv'ĩ-tŷ), and grace only by thorough training and regular exercise. Likewise, boys and girls and men and women become and remain strong, active, vigorous, and graceful through careful training and regular exercise.

**Benefits of Exercise.** — Our muscles grow hard and strong through use; if not actively used, they become soft and flabby. If we do not use our bodies in active work or exercise, the circulation of blood in some of the organs may become sluggish, and so they will not do their work well, and may gradually (grǎd'ũ-ǎl-lŷ) become diseased. If certain muscles are used but little, we do not get good control of them, and hence our movements will not be graceful when they are used.

**Deep-breathing Exercises.** — The more oxygen any part of the body receives, the better able it is to do its work. Therefore deep-breathing exercises are among the very best for all to practice, since they bring an



increased supply of oxygen to the body, and also aid one in forming the habit of taking more air into the lungs in the ordinary (ô'r'dī-nă-rŷ) breathing. The two following are especially good, because they are easy to learn and can be conveniently (kõn-vên'yënt-lŷ) used.

(1) Breathe in all the air you possibly can through the nose in one breath, and then let it out slowly through a very small opening in the mouth. This may be practiced while standing, walking, sitting, or even while lying in bed. The chief point is to be in pure, cool air.

(2) Stand with your hands above your head, and then try to touch the floor, bending from the waist but not bending the knees. As you bend, breathe out all the air possible, and breathe in all you can while returning to an erect position.

These and many other exercises will both increase the capacity (kă-păs'î-tŷ) of the lungs and strengthen the breathing muscles. Since ability to run or skate fast, as well as strength and skill in most active games, depend largely upon breathing capacity, children will see that it is well worth while to practice these exercises. It is also true that people subject to colds or almost any illness can greatly strengthen themselves, and often gain good health by faithfully practicing deep breathing. Ten minutes' practice twice a day, at night before

retiring and upon rising in the morning, will often result in great benefit.

**Games and Sports.** — Baseball, basket ball, tennis, bicycle riding, swimming, and skating are all fine exercise for the lungs as well as for the rest of the body. Of course out-of-door skating is better than indoor, because of the purer air. Any of the numerous games that require running are very good for developing strength and quickness. Rowing is excellent, especially for the chest, back, lungs, arms, and legs, and because it develops both sides of the body equally well. Dancing, marching, and folk games help to make one graceful; but dancing in a crowded, ill-ventilated room is likely to be of greater injury than benefit.

**Exercises to help Digestion.** — The second of the breathing exercises given above is excellent in helping digestion, because it strengthens the muscles of the abdomen, and also improves the circulation in the intestines, liver, and other organs. For similar reasons all bending, turning, and stretching exercises are likely to assist digestion. Massaging (*mā-sāzh'ing*) (rubbing or kneading) any part of the body that is not working well, or that is in pain, is often helpful, because it improves the circulation of blood in that part. Of course running, walking, and all games are likely to improve digestion, because of their good effect upon the circulation.

**Walking.** — Walking takes one out of doors, and is beneficial in other ways. Of course the faster a person walks, the greater the effect upon his circulation. In walking we should be careful not to let our weight fall upon the heels. This habit is stiff and awkward, and besides it jars the spine and brain. Instead we should let the ball (center) of the foot strike the ground first. This makes walking both easier and more graceful.

Children should not ride to school or anywhere else in a street car or other closed vehicle, when they have time and strength to walk. Instead of tiring them, such exercise in the out-of-door air will make them better able to do good school work.

**Bookworms.** — Some children become so fond of reading and study that they forget to play. Often, too, they really think they are doing something wise and worthy of praise because the older members of the family speak of it as a sure sign of being a good scholar, and hence a successful man or woman. This is, to say the least, a very mistaken idea.

It is wise to study faithfully in school and during the required hours at home; but in free time, active play and vigorous exercise should be the rule for those who really want to succeed in life. A brain crammed with information (în-fôr-mă'shŭn) is of little value without a healthy body to make use of it.

It often happens that among the pupils who stand

highest in a class, there will be several who are nervous and pale and sickly in appearance. While this may be caused by improper food and lack of pure air, it often results from want of play and exercise. They are developing the mind at the expense of the body.

All children who have no liking for out-of-door games should be taught to play and, if necessary, be made to do so. Indeed, if they but realized what a good effect such fun and exercise would have upon their future health and usefulness, they would very likely be the most earnest about out-of-door play.

**Delicate Children.** — Some children are too weak to play well. It is natural not to enjoy doing what we cannot do at least fairly well. Therefore such children do not like games, and even find them unsafe. Nevertheless, they are the very ones who should persevere the most in training themselves to become strong and active.

For delicate children, the first important thing is to make sure that they are supplying their bodies with the right kind of food and the purest possible air. Then deep-breathing exercises should be regularly practiced several times daily. Gymnastic exercises learned in school, fast walking, and easy running may be practiced, little by little, to gain more strength and facility. Then by persevering in out-of-door games as far as strength will permit, they will rapidly improve both in

health, and in vigor and skill. The chief thing is to determine (dĕ-tĕr'mĭn) not to give up until one is strong and vigorous, and then to keep trying until the goal is won.

A plant in clay soil in a shady part of the garden grows but little. Transplant it to good soil in a place where sunshine and water are plentiful, and the change for better in its growth will be almost marvelous.

Many delicate persons are like such plants; and the right kind of food, air, water, exercise, and rest will in time bring about a similar change in health. This may seem quite impossible; but it has happened so often that the truth of the statement may be easily proven. We must not be satisfied to be delicate plants. To say nothing of the increased power for usefulness, there is far more fun in being strong and hardy.

**Girls and Exercise.** — Some girls have an idea that it is fine for them to be delicate and flower-like. They seem to think that somehow it makes them more interesting and attractive. Pale complexion, soft muscles, and small waists are signs of ill health and not of beauty. The color, muscle, and grace that active out-of-door games and exercises will give girls are their greatest possible beauty. Such exercises will also better fit them for the duties of life.

**Adults and Exercise.** — After leaving school and beginning work, many give up play and exercise.

After a time, a little run to catch a street car will get them out of breath. Any extra physical effort makes them sore and lame, since their muscles have become soft and flabby from lack of use.

Fifteen minutes, twice a day, at night and in the morning, with Indian clubs, dumb-bells, chest weights, or merely practicing breathing, bending, arm and leg exercises, will keep the muscles of such persons in fair condition. A few miles' brisk walk to and from the place of business will likewise be of great benefit.

Often nothing of this kind is done simply through lack of thought. Then one gets into the habit of not exerting himself, and exercise becomes distasteful. One should remember that it pays to keep the muscles hard through regular exercise. In the first place, there is much satisfaction in being strong and in being able to do and to endure. Then by keeping vigorous muscles and active circulation, we are best able to prevent nervousness, disease, and much else that is both uncomfortable and expensive.

**Home Gymnasiums.**—When the weather permits, out-of-door games and exercise are always better than exercise indoors. For this reason it is of doubtful value for children to join a public gymnasium, if they go there at times favorable for out-of-door play. However, a home gymnasium with a horizontal bar, chest weights, swinging rings, trapeze, dumb-bells, and

Indian clubs makes exercise in unpleasant weather more attractive.

**The Right Ideal for the Body.** — A fond parent sometimes says, "I cannot do too much for my child." By that he means that he will spare no thought, or pains, or labor on the child's training and education.



A public school athletic meet.

To him his child is the best gift of God. Only in its highest development will the parent's greatest possible joy and satisfaction be realized. Therefore his ideal for the child is to make all of it that he possibly can.

This is the ideal which every child should have for

his own body. "My greatest possible usefulness and happiness in life depend largely upon what I make of my body. It is the most wonderful of created things. It is God's best gift to me. How ungrateful I should be not to keep so marvelous a gift pure, clean, and undefiled; how thoughtless and negligent, not to make of this body all that God in His goodness and wisdom has made possible for it to become."

With such an ideal earnestly and perseveringly followed, there are, indeed, few boys and girls who would not know the great joy and usefulness that is possible with a well-developed mind in a healthy, capable body.

**The Right Ideal for Home and Country.** — It would, to say the least, be selfish, if we were content simply to gain health and strength for ourselves. Knowing their great value, we should want all our friends to enjoy them, too. In fact, whatever can be done in our city or village that will tend to give better health to everybody should receive our earnest support.

A pure water supply, the best disposal (dīs-pōs'āl) of sewage and garbage, clean streets, tidy homes, beautiful shade trees, numerous parks,—all make for better health in a city. We know that the body should be developed and trained along with the mind. Therefore roomy, well-ventilated school buildings with ample playgrounds, good gymnasium, convenient baths, and large swimming pool are needed.



In many cities and villages, health officers are doing excellent work in preventing the spread of disease and in improving the conditions of living in many ways. By analyzing (ăn-â-liz'ing) the milk that is sold and inspecting the dairies that furnish it, they are saving the precious lives of many babies, and adding to the strength of many others. Should such officers, in the place where we live, be careless or negligent about these important matters, we should do our best to induce people to make these careless officers attend properly to their duties.

Public officers are trying to compel those who manufacture food to furnish that which is pure. Through smoke consumers (kõn-sũm'ěrz) and in other ways, efforts are being made for purer air in cities. "Fresh Air Missions" and "Day Nurseries" (nũrs'ěr-iz), as well as purer and cleaner milk, are counting for the better health of babies and little children.

Public playgrounds, where children can enjoy games and learn to develop their bodies under wise direction, are being started in many cities. Public baths for the use of those who have not such convenience (kõn-vẽn'yẽns) at home are being built. Public School Athletic Leagues, whose purpose is to interest all children in developing their bodies, rather than to train a few skilled athletes, are being started. Associations (ăs-sõ-sĩ-â'shũnz) for the prevention and cure of tuber-

culosis are being organized (ô'găn-îzd) by earnest physicians and charitable citizens.

All these movements make for better health and greater happiness. We should all work earnestly to advance these good causes in the city or village in which we live. As true lovers of health and usefulness may our ideal be *Good Health for Home and Country*. May we also do all in our power to spread knowledge of the simple habits that will tend to make this precious possession a more universal one.

#### POINTS FOR SPECIAL STUDY

1. Through exercise we keep our muscles hard and strong, and the organs of our body active and healthy.

2. Deep-breathing exercises are among the most important for all. Through these, we may gain strength for work and play, and help rid ourselves of colds and other disagreeable illness.

3. It is foolish to develop the mind at the expense of the body. It is far more important for delicate children to learn to like play and games and to develop bodily health and strength than it is to stand high in their studies.

4. It should be the ideal of both boys and girls to develop strong, healthy bodies through exercise. They should also aim to become fond of certain games and exercises, and to make use of them all their lives.

#### QUESTIONS

1. State three benefits of exercise.
2. Why are deep-breathing exercises of especial value?
3. Describe the first deep-breathing exercise that is given; the second deep-breathing exercise.

4. Besides increased power in play and work, what other benefits may come from practicing deep-breathing exercises?

5. Mention several exercises that are excellent for the lungs as well as for the rest of the body.

6. Why is skating out of doors better than indoor skating? Tell why rowing is excellent exercise.

7. What is said of dancing, marching, and folk games?

8. Mention some exercises that are helpful to digestion, and state why.

9. Tell what is said of rubbing and massage.

10. Why should one be careful to step on the ball of the foot when walking? Tell all that is said of walking.

11. How do some children become "bookworms"? State why this is unwise.

12. Mention the first things of importance for delicate children to look out for.

13. What exercises are especially important for delicate children to practice?

14. How may delicate children gradually become strong and skillful in games?

15. How are delicate children like plants in poor soil in a shady part of the garden?

16. What is said concerning girls and exercise?

17. State the effects upon adults of giving up play and exercise.

18. How may adults keep their muscles hard and their bodies in good physical condition?

19. Tell what is said about home gymnasiums.

20. What is the right ideal for every child to have for his body? for home and country?

21. Tell some good things health officers are accomplishing. Mention several public movements to improve health.

## CHAPTER XXIX

### THE CARE OF LITTLE CHILDREN

Many children have dear little brothers and sisters at home of whom they often take care. It sometimes happens that these helpless little ones are injured while in charge of an older child. Of course this is not caused by want of love. As a rule, it is due to not knowing better or to not being careful. How precious these dear little babies are, all know. All, too, will be eager to learn how best to guard and keep them from harm.



Little Marjorie.

**Food for Children.** — Until a child is one year old, he should receive no solid food of any kind, as the digestive organs are not yet ready to take care of any food not liquid. Now whatever gets into little babies' hands soon finds its way to their mouths. For this reason, babies should not be allowed to handle fruit, bread, cake, or any other solid food.

For children from one to two years old, the best foods are fresh milk, well-cooked cereal, dry toast, or unsweetened zwieback (tzwě'băk), broth, and coddled eggs. They may also be given orange juice, and physicians sometimes advise a little prune pulp, baked apple, or apple sauce. Great pains should be taken to buy pure milk and to keep it fresh and sweet.

During the third year, finely cut chicken, lamb, or beef may be eaten. So also may thoroughly boiled rice, baked potato, spinach, asparagus tips, celery, carrots, squash, and string beans; but all such vegetables should be thoroughly cooked. For dessert junket, custard, and plain rice or tapioca pudding are excellent. Ice cream, too, is good, if it is eaten slowly. Milk is the best drink, and weak cocoa is the next best. Neither coffee nor tea should be given to children.

Peas, beans, nuts, and dried fruits should not be eaten until children can be impressed with the need of chewing them thoroughly. For the same reason popcorn should be avoided. The fascinating popcorn and peanut wagon has had a large share in weakening the good digestion of many city children. Both popcorn and peanuts are hearty foods, and should not be taken soon after a full meal.

After the age of three, children may be given a piece or two of candy for dessert at the midday meal.

Sirup, jams, pies, rich cakes, and puddings, and all fried foods should be avoided until children are older. In fact, they should never be eaten except in small amounts by any one.

**Water for Little Children.** — Babies should be trained to take water between nursings. In very hot weather, they should be given less food and more water than at other times of the year. If there is any doubt as to the purity of the drinking water, it should be boiled and cooled before being given to any members of the family, especially to little children.

**Giving Medicine.** — Some people give medicine to children very frequently. Often this is done for little or no reason except that the child is fretful. It is quite natural for most babies to cry more or less. In fact, this is one of the ways they get exercise. Bracing air, proper food, and pure water are the best remedies for all; and children who have these, will be much better off, as a rule, without drugs. It is a good plan not to give medicine at all, unless advised to do so by a physician.

**Baby's Outings.** — One of the chief duties of the older children with reference to baby is to take him for an outing. Now most babies have the habit of throwing their covering off, even in cold weather. On this account, much patience is required to keep the little things properly protected from the colds

and other illness that often follow exposure to the weather.

Especial care should also be taken to protect the eyes of infants from the sun or other bright light. Often this can be done by adjusting the carriage top, or by changing the position of the carriage. The sight of many children has been injured for life by lack of protection of this kind in babyhood.

In summer and early autumn, any time from 7 A.M. until sunset is good for baby to be out of doors. In winter or spring, from 10 or 11 A.M. to 3 P.M. is the best time; but severe winds should be avoided any time of day. The practice of having baby sleep in his carriage on a well-protected part of the veranda is excellent. By so doing, he can have the purest and most bracing air several hours of the day. This practice has been rapidly growing in favor because, through it, many sickly babies have become well and strong. However, some one should always be near enough to see that the covering is kept in place, and that the little one is in every way comfortable.

**Lifting Children.** — In lifting a young baby the right hand should grasp its clothing just below the feet, and the left hand should be slipped beneath the baby's body to its head. The back should always be supported while young babies are being carried or held.

In lifting a child who is old enough to run about, the hands should be placed under its arms. It should never be lifted by the hands or wrists, as injury may easily be done.

**Falls.** — There is a space on the upper part of babies' skulls that does not harden until they are about a year and a half old. This is commonly called the "soft spot." A hard blow near this spot is likely to be fatal. Little ones have been instantly killed by falling and striking the head. In many schools there are children who have very little or no power to learn. Often they go on from grade to grade on account of their size, and because they learn as much in one class as in another. If there is a school for defectives, they are sent there. Children are sometimes among these defectives simply because they were so unfortunate as to get a hard fall in babyhood.

**Keeping Baby from injuring Himself.** — It is not uncommon for little children to choke to death from something lodging in the throat. On this account they should not be allowed to handle buttons, marbles, or anything that can be readily swallowed. Playthings from which small pieces can be broken or bitten should also be avoided.

Babies should not be allowed to handle anything that is sharp or pointed. Painful wounds have been caused, and the use of an eye or an ear lost by such



carelessness, for babies, of course, know no better than to harm themselves.

The so-called "pacifiers" which so many children are given are likely to cause the mouth to become misshapen, and they also afford a lodging place for germs. For these reasons they should not be used. An ivory ring or a silver spoon to bite, now and then, will give comfort and do no harm.

**Walking.** — Infants should not be encouraged to stand or to walk until they make attempts of their own accord, or show other evidence of having enough strength. As a rule, they will try to stand and to walk about the age of one year, and sometimes even three or more months before. At no time should they be urged to do more than they seem to have strength for. Standing or walking before the legs and feet are strong may cause bow legs and make the body less beautiful. These practices may also break down the natural arch of the foot, thus causing weakness for a lifetime.

**Playing with Babies.** — Children under six months old should not be played with, for they ought at all times to be kept as quiet and undisturbed as possible. Trying to make young babies smile, attracting their attention in any way, tossing them up in the air, and other practices that are intended to please or to show baby off, may really injure him. In fact, the same

thing is more or less true of all children until they are strong enough to run about. Gentleness and lack of excitement are indeed the very best conditions for all small children. Playing hard just before going to bed is likely to make any child nervous and wakeful.

**Little Children and Diseases.** — Little children are very likely to take colds, measles, scarlet fever, and other diseases. For this reason, they should not be taken in street cars or other closed public conveyances in winter. Crowded stores and other places where there is likely to be impure air should also be avoided.

Children should not be kissed on the mouth, as they may catch disease in that way. Little babies often drop toys, spoons, and other playthings. These should always be carefully wiped off before they are given back, since harmful disease germs may be in the dust they take up from the floor.

If little children begin the habit of mouth breathing, their mouths should be closed while they sleep. If carefully watched, the habit may be stopped in this way. Too much pains cannot be taken to prevent them from starting this habit, as their health is sure to be seriously injured by it.

By and by the babies of to-day's home circle will be starting school. What pride the family will take in having them active and strong both at play and at work. How sorry any member would be to have one

inferior in mind or in body because of his carelessness or poor judgment. Looking out for the health and happiness of others is among the greatest privileges of life. It is, indeed, good fortune to begin such service in childhood by faithful care of the sweet, helpless little ones at home.

#### POINTS FOR SPECIAL STUDY

1. Babies should not be allowed to handle food that requires chewing. Candy, rich desserts, and fried foods should not be given to small children, nor should such foods be eaten when one is older, except in small quantities.

2. Infants should at all times be kept warm. Bright light may injure their eyes, and so they should be protected from it. The best time to take little children out of doors in winter and spring is from 10 or 11 A.M. to 3 P.M.

3. When being lifted or carried, an infant's back should always be supported. Children should never be lifted by the hands or wrists.

4. Babies should not be allowed to handle anything which may choke them, or with which they may injure themselves.

5. Infants may be killed or injured in mind or body for life, if allowed to fall.

6. Standing or walking before the legs and feet are strong enough may cause crooked legs or weaken the body by breaking down the natural arch of the foot.

7. Babies under six months old should not be played with at all, and the less all children are played with until they are old enough to run about, the better.

8. Little children take contagious diseases very readily. For this reason they should in winter be kept from street

cars, crowded stores, and other places where the air is likely to be impure.

### QUESTIONS

1. Until what age should a child be fed only liquid food?
2. Tell the best food for children from one to two years old.
3. What meats may be given the third year? What vegetables? What desserts?
4. Tell all you can about the best food for children from one to two years old.
5. Tell what is said about food for children after the age of three.
6. What care should be taken concerning the drinking water given to children?
7. Mention two things to be especially careful about when one has a baby out of doors.
8. What is the best time of day to take a baby out of doors in winter?
9. What care should be taken in lifting very young babies? in lifting any little child?
10. Why should buttons, etc., not be kept within the reach of infants?
11. How may babies injure themselves with sharp or pointed instruments? How are "pacifiers" injurious?
12. Tell why a fall may be especially harmful to a little baby.
13. Tell two bad results of standing or walking before the legs are strong enough.
14. Until what age should children not be played with at all? Why is hard play just before bedtime unwise?
15. Tell how to help keep children from forming the mouth-breathing habit; from taking contagious diseases.



## GLOSSARY

**Abdomen** (ăb dō'měn), that part of the body between the chest and legs.

**Adenoids** (ăd'ê noidz), spongy growths in the upper part of the throat, back of the nose.

**Albumen** (ăl bū'měn), one kind of proteid; the chief component of white of egg.

**Alcohol** (ăl'kô hōl), the intoxicating element of wine, beer, whisky, etc.

**Alcoholic** (ăl'kô hōl'ík), containing alcohol.

**Alimentary canal** (ăl i mēn'tá rý), the food channel of the body.

**Aorta** (ă ôr'tá), the great artery through which blood passes to every part of the body except the lungs.

**Artery** (ăr'tēr ý), one of the tubes through which blood passes from the heart.

**Astigmatism** (ă stig'mâ tiz'm), a defect of the eye caused by a condition of unequal curvature of the lens or cornea.

**Auditory canal** (ă'dī tō rý), the tube from the opening of the ear to the drumhead of the middle ear.

**Auricle** (ă'rī k'l), the external ear.

**Aurist** (ă'ríst), one skilled in treating disorders of the ear.

**Bacteria** (băk tē'ri ă), tiny plants often called germs or microbes.

**Bowels** (bou'ēlz), the large and small intestines together.

**Bronchi** (brōn'kí), the two branches of the windpipe entering the lungs.

**Bronchial tubes** (brōn'kí al tūbz), the divisions of the bronchi.

**Bronchioles** (brōn'kí ōlz), small divisions or branches of the bronchial tubes.

**Capillary** (kăp'íl lâ rý), one of the small blood vessels connecting arteries and veins.

**Carbon dioxide** (kăr bōn dī ōks'íd), the poisonous gas breathed out from the lungs.

**Carbonic acid gas** (kăr bōn'ík), another name for carbon dioxide.

**Cerebellum** (sēr ê bēl'lūm), the part of the brain that controls combined muscular action; the hinder and lower part.

- Cerebrum** (sēr'ē brūm), the fore part and larger division of the brain.
- Chyle** (kil), the digested food in the intestine.
- Chyme** (kim), the partly digested food leaving the stomach.
- Cilia** (sil'ī à), tiny hairs in the air passages.
- Circulation** (sēr kû lā'shūn), the movement of the blood through the blood vessels of the body.
- Combustion** (kōm būs'chūn), the union of carbon and oxygen resulting in heat.
- Component** (kōm pō'nēnt), one of the parts that make up a thing.
- Constipation** (kōn stī pā'shūn), a state of the bowels in which the expulsion of waste is not regular or sufficiently frequent.
- Consumption** (kōn sūmp'shūn), a wasting away of the body, or tuberculosis of the lungs.
- Corpuscles** (kōr'pūs s'lz), the tiny cells of the blood commonly described by their color, red or white.
- Dandruff** (dān'drūf), the small scales which come off from the scalp.
- Dentine** (dēn'tīn), the ivory-like substance lying under the enamel of the tooth.
- Dermis** (dēr'mīs), the true skin.
- Diaphragm** (dī'ā frām), the muscle which separates the cavity of the chest from that of the abdomen.
- Drumhead** (drūm hēd), the membrane separating the outer from the middle ear.
- Ear drum** (ēr drūm), the middle ear.
- Enamel** (ēn ām'ēl), the hard outer covering of a tooth.
- Enema** (ēn'ē mā), an injection of fluid into the lower part of the bowels.
- Epidermis** (ēp I dēr'mīs), the outer layer of the skin.
- Epiglottis** (ēp I glōt'tīs), the valve which keeps food and drink from passing into the windpipe.
- Esophagus** (ē sōf'ā gūs), the tube extending from the throat to the stomach.
- Eustachian** (ū stā'kī an), the tube leading from the middle ear to the throat.
- Gall bladder** (gāl), the sac of the liver that secretes the gall or bile.
- Gastric glands** (gās'trik), the glands of the stomach that secrete gastric juice.
- Gastric juice**, the digestive fluid secreted by the glands of the stomach.

**Insensible perspiration** (In sən'si b'l pēr spī rā'shŭn), constant perspiration not noticed.

**Intercostal muscles** (In tēr kōs'tāl), the muscles between the ribs, used in breathing.

**Intestinal fluid** (In tēs'tī nal), the digestive fluid of the intestines.

**Intestinal glands**, the glands of the intestines that secrete intestinal fluid.

**Involuntary** (In vōl'ŭn tā rŷ), not under the control of the will.

**Kidneys** (kīd'niz), the two organs of the body that secrete urine.

**Large intestine**, the lower part of the intestines. It is larger around than the small intestine but not nearly so long.

**Larynx** (lār'inks), the windpipe.

**Liver** (liv'ēr), the largest gland of the body. It secretes bile or gall, which aids in digestion. It is in the right side of the abdomen.

**Massage** (mā sàzh'), rubbing or kneading the body.

**Mastication** (mās'tī kā'shŭn), the act of chewing food.

**Medulla** (mē dŭl'là), the back part of the brain connected with the spinal cord.

**Microbe** (mī'krōb), disease germ.

**Middle ear**, the middle part of the ear, sometimes called the ear drum.

**Mucus** (mŭ'kŭs), a secretion of glands in the lining of the air passages.

**Nitrogen** (nī'trō jĕn), the gas which forms the greater part of air.

**Nostril** (nōs'tril), one of the divisions of the nose.

**Oculist** (ōk'ŭ list), one skilled in treating diseases of the eyes.

**Oil glands**, glands of the skin which secrete oil.

**Optic nerve** (ōp'tik), the nerve which passes from the retina of the eye to the brain.

**Orthodontia** (ōr thō dōn'shà), the science of straightening teeth.

**Oxygen** (ōks'ī jĕn), the gas of air that is necessary to life.

**Pacifier** (pās'ī fi ěr), a rubber nipple given babies to quiet them.

**Pancreas** (pān'krē às), the gland secreting pancreatic juice.

**Pancreatic juice**, the digestive fluid secreted by the pancreas.

**Pasteurized milk** (pās'tēr iz'd), milk that has been heated to a temperature of about one hundred fifty-five degrees.

**Pericardium** (pēr i kār'dī ŭm), the membrane sac which incloses the heart.

**Perspiration** (pēr spī rā'shŭn), sweat.



- Perspiratory glands** (pēr spīr'ā tō rý), the glands of the skin that secrete perspiration.
- Pharynx** (fār'ínks), the part of the food canal between the mouth and the esophagus.
- Plasma** (pláz'má), the colorless fluid of the blood.
- Proteid** (prō'tē id), the component of food from which bodily tissues are built.
- Pulmonary artery** (pŭl'mō nā rý), the artery leading from the heart to the lungs.
- Pulmonary vein**, the vein which leads from the lungs to the heart.
- Pulp**, the soft tissue in the central cavity of the teeth.
- Pulse**, the beating or throbbing of the heart or blood vessels.
- Pupil**, the opening in the iris or colored part of the eye.
- Pylorus** (pī lō'rŭs), the opening in the stomach into the small intestine.
- Respiration** (rēs pī rā'shŭn), the act of breathing.
- Retina** (rēt'ī nā), the innermost coat of the eye, corresponding to the film of a camera.
- Rhythmic** (rīth'mík), having regular succession of motion.
- Saliva** (sā li'vā), secretion of the salivary glands.
- Salivary glands** (sāl'ī vā rý), the glands in the mouth secreting saliva.
- Secretion** (sē krē'shŭn), fluid secreted by a gland from the blood.
- Small intestine**, the part of the bowels between the stomach and the large intestine.
- Spinal cord** (spī'nal), the cord extending from the brain to the base of the spine.
- Starch** (stārch), a component of food which furnishes fuel for the body.
- Sterilized milk** (stēr'īl iz'd), milk that has been boiled to kill bacteria.
- Sternum** (stēr'nŭm), the breast bone.
- Stomach** (stŭm'āk), the part of the food canal between the esophagus and the small intestine.
- Sugar**, a component of food which furnishes fuel to the body.
- Thorax** (thō'rāks), the chest.
- Trachea** (trā'kē ā), windpipe.
- Urethra** (ŭ rē'thrā), the canal by which urine passes from the bladder and is discharged.
- Urine** (ŭ'rīn), the fluid excreted by the kidneys.
- Veins** (vānz), the vessels through which blood passes to the heart.
- Villi** (vil'li), hairlike tubes in the lining of the small intestine.

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